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A Record of, and Index to the Literature of ECHINODERMA published during the year 1893, and including much published in 1892 and the immediately preceding years.

Compiled by F. A. Bather.

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DEDICATION.

In offering to his fellow-workers this, his first attempt at a complete annual Record of Echinoderm Literature, the Recorder begs to remind them that his work can be greatly facilitated by a liberal exchange of their own publications in return. He therefore asks all workers on Echinoderma, especially those who appreciate the value of such a Record, to furnish him in future with copies of all their publications on this subject. The remuneration received by the Recorder would not enable him to purchase one quarter of the publications dealing with Echinoderma issued during a single year; but, to all those who care to send him their publications, he will be pleased to send a copy of the annual Record, at his own expense, as a slight acknowledgment. Books and papers may be sent, either through the Editor of the "Zoological Record," or direct to

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XIV. ECHINODERMA.

BY

F. A. BATHER.

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INTRODUCTION.

I. TITLES.—The total of 288 includes 54 from literature published before 1892, 102 from publications of 1892,* and 134 representing the work of 1893. The list is still incomplete, since many publications anterior to 1894, and known to contain Echinoderm literature, had not arrived at any library in London so late as September, 1894.

Under each title, references have been given to all Abstracts and Reviews of any importance that were known to the Recorder. References are also given to all Abstracts and Reviews of Echinoderm literature that were published in 1893. Such references are under the names of the authors of the papers reviewed, but are not numbered in the series.

Most of the titles are followed by certain figures in square brackets. These refer to the various divisions of the Subject- and Systematic Indices. For instance, under title (6) the following—[II, B, ii, a : D, ii; iv : F, iv, b. III, A. IV, D.] informs the reader that references

* The Record for 1892 was admittedly incomplete.

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to this paper will be found first in Division II.—Biology, Subheading—Morphology, ii subject—variation, a, special case—in form; then under Subheading—Bionomics, subjects, ii—special habits, and iv—feeding; next under Subheading—Auxology, iv—Asteroidea, b—brephic stages. Secondly, in Division III.—Distribution, Subheading A—Geographical. Thirdly, in Division IV.—Systematic, Subheading D—Asteroidea. Thus the contents of a paper can easily be discovered. References to the systematic index are only given when new genera and species are described or alterations made in nomenclature.

II. BIOLOGY.—The Index under this head is as complete as lies in the Recorder's power. For example: it is believed that every case of deviation from the normal symmetry mentioned in this mass of literature will be found indexed on pp. 35, 36. Other modes of variation have been as carefully attended to, and the same principle has governed all the rest of the index.

The Section F, which in previous Records bore the subheading EMBRYOLOGY, now includes all phases of the Life-history, from the first formation of the gonads to the death of the individual. It is therefore necessary to adopt for its subheading the previously proposed term AUXOLOGY.

III. DISTRIBUTION.—In the Geographical Index the order is from N. to S. down the Atlantic, then round Australia, northwards through the Malay Archipelago and adjacent seas, and then from S. to N. up the Pacific.

IV. SYSTEMATIC.—This Index is complete, with certain exceptions noted in List of Titles. Reference to this Index, in combination with the cross-references to other sections given under Titles, will put the student on the track of everything said about any particular species in all the 288 papers here recorded.

This Index contains 316 new species, distributed as follows:—*Holothuroidea*, 27; *Echinoidea*, 124; *Asteroidea*, 38; *Ophiuroidea*, 9; *Crinoidea*, 106; *Cystidea*, 4; *Blastoidea*, 8. There are also many new genera and new varieties, and, especially among Holothurians, an appalling number of *nomina nuda*.

A very large proportion of the new species of *Echinoidea* come from the Cretaceous and Tertiary rocks of France, while the bulk of the new species of *Crinoidea* are, as usual, furnished by the Carboniferous rocks of North America.

This list of new species is most probably imperfect; but those authors, at any rate, have no right to complain who either decline to indicate which of their species are new (*e.g.*, British Museum Catalogues), or obscure the fact by affixing to the name of the species their own name or that of a friend, often with a wrong date (*e.g.*, many French writers), or who describe species as "n. sp." which have already been described months before (*e.g.*, Dr. Hartlaub). On this point read what the Recorder for *Insecta* says on his page 3.

Throughout the record, the Recorder has merely taken facts and names

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as he found them, without expressing an opinion as to their validity ; he has, however, done his best to discover and quote the published opinions of others. The few remarks within square brackets are inserted to prevent confusion, and are the only evidences of personality that the Recorder has permitted himself.

I.—TITLES.*

1. Agassiz, A. Three letters to the Hon. Marshall McDonald on the Dredging Operations off the West Coast of Central America to the Galapagos, to the West Coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission steamer "Albatross," Lieut. Commander Z. L. Tanner, U.S.N., commanding. Bull. Mus. Harvard, xxi, pp. 185–200 (1891).

French Translation by E. L. Bouvier, Ann. Sci. Nat. xii, pp. 319–341 (April, 1892).

This is practically a preliminary notice of (3).

2. ——. *Calamocrinus diomedæ*, a new stalked Crinoid, with notes on the Apical System and the Homologies of Echinoderms (being No. 1 of Reports on an exploration by the U. S. . . . ss. "Albatross," during 1891 . . .). Mem. Mus. Harvard, xvii, No. 2, 95 pp., 32 pls. (Jan. 1892). [II, B, i, a, 2, 3, 5 ; c, 2, 8 ; d, 7 ; f, 1, 2, 3 : F, vi, c.]

For preliminary notice, see Agassiz, Zool. Rec. 1891. Abstracts, J. R. Micr. Soc. 1892, p. 377 ; by O. Jaekel, N. Jahrb. Min. 1893, i, pp. 562 & 563 ; in Ludwig (158).

3. ——. Reports on the Dredging Operations off the West Coast of Central America to the Galapagos, to the West Coast of Mexico, and in the Gulf of California, ... steamer "Albatross," &c. II. General Sketch of the expedition of the "Albatross," from February to May, 1891. Bull. Mus. Harvard, xxiii, No. 1, 89 pp., 22 pls. (Feb. 1892). [II, D, v, c, 3. III, A, i ; iii.]

4. Aguilera, J. G. [& Ordoñez, E.] Datos para la geología de México. Tacubaya : 1893, 8vo, 87 pp. The stratigraphic part by Aguilera only. [III, B, ii ; iii. IV, C, F.]

5. Alcock, A. Natural History Notes from H.M. Indian Marine Survey steamer, "Investigator," Series ii, No. 9. An account of the Deep-Sea Collection made during the season of 1892–93. J. Asiat. Soc. Bengal, lxii, pp. 169–184, pls. viii & ix (1893). [III, A, iii. IV, C, D, E.]

* An asterisk prefixed to a quotation indicates that the Recorder has not seen the Journal or Work referred to.

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6. [ALCOCK, A.] Natural History Notes from H.M. Indian Marine Survey steamer "Investigator," Commander C. F. Oldham, R.N., commanding. Series ii, No. 7. An account of the Collection of Deep-Sea *Asteroidea*. Ann. Nat. Hist. (6) xi, pp. 73–121, pls. iv–vi (Feb. 1893). [II, B, ii, a: D, ii; iv: F, iv, b. III, A. IV, D.]
Abstract, J. R. Micr. Soc. 1893, p. 194.

7. ANDREWS, E. A. Experimental Embryology. Amer. Natural. xxvi, pp. 367–382, & 580–592 (May and July, 1892).
Gives a critical account of HERTWIG, O. & R. Ueber der Befruchtungs- und Theilungs-vorgang des thierischen Eies unter dem Einfluss ausserer Agentien (p. 586); of HERTWIG, O. Experimentelle Studien aus Tierischen Ei während, und nach der Befruchtung (p. 588); of BOVERI, Ein geschlechtlich erzeugter Organismus ohne mutterliche Eigenschaften (p. 589); and of DRIESCH, Entwicklungsmechanische Studien (Zool. Rec. 1891) (p. 590).

8. APPELLÖF, A. Om Bergensfjordenes faunistiske praeg. Bergens Mus. Aarsber. 1891, No. 2, 14 pp. (1892). [III, A, ii, a, names of species found at Bergen.]

9. ARNAUD, H. Profil géologique du chemin de fer d'Angoulême a Marmande, Région crétacée. Act. Soc. Bordeaux, xlv, pp. 11–43, pl. i (1892). [III, B, iii, a.]

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10. ——. The Recapitulation Theory in Palæontology. Nat. Sci. ii, pp. 275–281 (April, 1893). [II, F, i, a.]

11. ——. The *Crinoidea* of Gotland. Part I. The *Crinoidea Inadunata*. Svenska Ak. Handl. xxv, No. 2, 200 pp., 10 pls. (Dec. 1893). [II, B, i, f, 1, 2; ii, a, e: D, v, c, 3; viii: E, iii: F, vi, c. III, B, iv, g. IV, F.]
Reviews,—by G. J. HINDE, Geol. Mag. Dec. iv, vol i, pp. 130–136 (March, 1894); by G. A. J. COLE, Nature, l, pp. 59 & 60 (May, 1894); Nat. Sci. iv, pp. 219 & 220 (March, 1894); Amer. Geol. xiii, p. 355 (May, 1894); and Abstract, J. R. Micr. Soc., Feb. 1894, pp. 68 & 69.

——. [See also BOLTON (23).]

12. BAVAY, —. Préparation des Échinides à sec. Feuille Natural. xxiii, No. 267, pp. 43 & 44 (Jan. 1893). [II, E, i.]

13. BEDDARD, F. E. Animal Coloration. An account of the principal Facts and Theories relating to the Colours and Markings of Animals. London: 1892, 8vo, viii & 288 pp., 4 col. pls.
[II, D, v, c, 1. See pp. 16, 36, 38, & 255.]

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14A. BEECHLER, C. (by error for BEACHLER, C. S.). Corrected list of fossils found at Crawfordsville, Ind. Ann. Rep. geol. Nat. Hist. Indiana, 1888, pp. 65–76. (Dated 1889, published 1891.) [*Crin.*, *Blast.*, *Ech.*, *Ast.*, *Cyst.*, on pp. 66–68.]

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15. ——. On the Characters and Variations of *Pontaster tenuispinis*. P. Zool. Soc. London, 1892, pp. 430–433, pl. xxvi (Oct. 1892.) [II, B, ii, b: F, i, b.]

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16. ——. Catalogue of the British Echinoderms in the British Museum (Natural History). London: 1892 (published Jan. 1893), 8vo, xviii & 202 pp., 16 pls. [II, B, i, a, 1. III, A, ii, 3.]

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24. BOUTAN, L. Voyage dans la Mer Rouge. Rev. biol. Nord France, iv, pp. 173–183 (Feb.), 210–223 (March), 266–272 (April), 351–362 (June), 403–410 (July), 463–468 (Aug.), 502–510 (Sep.), v, pp. 40–44 (Oct.), 53–69 (Nov.), pls. vii–x of vol. iv (1892). [II, D, ii. III, A. IV, C.]

25. BOVERI, T. An organism produced sexually without characteristics of the mother. Amer. Natural. xxvii, pp. 222–232 (March, 1893). [II, F, vii.]

This is a translation by T. H. MORGAN of BOVERI, "Ein geschlechtlich erzeugter Organismus, &c." 1889, with introduction by translator, and 5 new figures by the author. [See ANDREWS (7).]

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28. CAYEUX, L. Mémoire sur la "Craie grise" du Nord de la France. Ann. Soc. geol. Nord, xvii, pp. 105–141, pl. iii (1890). [III, B, iii. IV, C.]

29. ——. Note sur le *Micraster gosseleti*, espece nouvelle de la Craie blanche des environs de Lille. *T. c.* pp. 180–183, pl. iv (1890). [III, B, iii. IV, C.]

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31. ——. On an abnormal specimen of *Antedon rosacea*. Ann. Nat. Hist. (6) xii, pp. 195–198, pl. viii (Sept. 1893). [II, B, ii, e: D, vii.]

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33. CHEVREUX, E. Préparation des Echinides à sec. Feuille Natural. xxiii, p. 78 (March, 1893). [II, E, i.]

34. CHUN, C. Die Bildung der Skeletheile bei Echinodermen. Zool. Anz. xv, pp. 470–474. (December, 1892), [II, B, i, a, 4: F, i, f.]

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36. ——. The Mesozoic *Echinodermata* of the United States. Bull. U. S. Geol. Surv. No. 97, 207 pp., 50 pls. (1893). [II, B, i, f, 1; ii, b: E, iii. III, B, iii. IV, C, D, E, F.]

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38. COTTEAU, G. H. Notice sur l'*Hemipneustes oculatus* (Drapiez), Cotteau de la Craie de Ciply et les autres espèces du genre *Hemipneustes*. Mem. Soc. malac. Belgique, xxv, pp. 1–10 (1890). [III, B, iii. IV, C.]

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42. ——. Échinides nouveaux ou peu connus. 11e Article. Mem. Soc. zool. France, v, pp. 731–742, pls. x & xi (Dec. 1892). [II, B, ii, d, e. III, B, ii ; iii. IV, C.]

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43. ——. La Famille des Cidaridées a l'époque Éocène. C.R. Ass. Franc. 1892 (2), pp. 343–347 (1893). [III, B, ii. IV, C.]

A synopsis of COTTEAU (44 pars.).

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46. ——. Échinides nouveaux ou peu connus. 12e Article. Mem. Soc. zool. France, vi, pp. 344–354, pls. viii & ix (Dec. 1893). [III, B, ii ; iii. IV, C.]

47. COTTEAU, F. [Echinides du Liban.] Act. Soc. Helvet. lxxvi, p. 58 (1893). [III, B, ii, iii. IV, C.]

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130. JOURDAN, E. Sur les corps jaunes du tissu conjonctif des Echinodermes et des Géphyriens inermes. C.R. Ass. Franc. 1891 (2) pp. 537 & 538 (1892). [II, C, iv.]

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131. KAYSER, E. Die Fauna des Hauptquarzits und der Zorger Schiefer des Unterharzes. Abh. Preuss. geol. Landesanst., Heft i, 140 pp., 24 pls. (1889). [III, B, iv, f. IV, F.]

132. KENNEL, J. DE. Réponses de [à] Questions, proposées par M. le Prof. Léon Cosmovici. Congr. internat. Zool., IIe Session, Première Partie, pp. 68–73. (Moscou, 1892.) [II. B, i, a, 6 : F, i, e.]

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134. ——. Preliminary observations on a Natural History Collection made in connection with the Surveying Cruise of H.M.S. "Myrmidon," at Port Darwin and Cambridge Gulf, September to November, 1888. P. Soc. Queensland, vi, pp. 219–242 (1889). [II, D, iv.]

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that many species of Holothurians, to which new names have here been assigned, could not, in the opinion of F. J. BELL, be accurately determined, and further states that the descriptions and figures now given are inadequate.

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136. ——. Synopsis of American Carbonic *Calyptræidæ*. P. Ac. Philad. 1890, pp. 150–181 (1890). [II, D, viii.]

137. ——. Remarks on the Perisomic Plates of the Crinoids. Amer. J. Sci. xli, pp. 247 & 248 (March, 1891).

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139. ——. The Geological Formations of Iowa. Rep. Geol. Surv. Iowa, i, pp. 13–144, pls. i–ix (1893). [III, B, iv.]

140. ——. Bibliography of Iowa Geology. *T. c.* pp. 211–464 (1893). [II, E, iii.]

141. KOCH, G. VON. Photographische Abbildungen von lebenden Seethieren. MT. Stat. Neapel, xi, pp. 1–3, pl. i (Sept. 1893). [II, D, vi.]

[Gives photographs of *Ophioglypha lacertosa* and *Asteropecten bispinosus*.]

142. °KOEHLER, R. Les idées nouvelles sur les Echinodermes. Rev. gen. Sci. ii, pp. 102–109 (March, 1891).

143. KOJEVNIKOV, G. La Faune de la mer Baltique orientale et les problèmes des explorations prochaines de cette faune. Congr. internat. Zool., II^e^ Session, Première Partie, pp. 132–157. (Moscou, 1892.) [III, A.]

144. KORSCHELT, E. [& HEIDER, K.] Lehrbuch der vergleichenden Entwicklungsgeschichte der wirbellosen Thiere. Spezieller Theil. Erstes Heft. Jena: 1890, 8vo, xii & 308 pp. [II, F, i, b.]

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145. ——. Recherches sur les Échinides de l'Aptien de Grandpré. Bull. Soc. geol. 3 ser., xx, pp. 38–100, pls. ii–iv (Nov. 1892). Also preliminary note, p. xlii. [II, B, i, c, 2, 4; ii, d: F, iii, c. III, B, iii. IV, C.]

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146. [LAMBERT, J.] Etudes morphologiques sur le plastron des Spatangides. Bull. Soc. Yonne, xlvi, Section II, pp. 55–98, and folding table (April, 1893). [II, B, i, c, 2. IV, C.]

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152. LOHEST, M. Sur la présence d'un banc de calcaire à échinides à la partie supérieure du calcaire à crinoides exploité pour pierres de taille. Bull. Soc. geol. Belgique, xix, pp. 93 & 94 (1892). [III, B, iv.]

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153. ——. *Crinoidea*. Exploration scientifique de la Tunisie. Paléontologie, pp. 390–392. Avec note de A. PÉRON (1893). [III, B, iii. IV, D, F.]

154. ——. Voyage de MM. M. Bedot et C. Pictet dans l'Archipel Malais. Echinodermes de la Baie d'Amboine. Rev. Suisse Zool. i, pp. 359–426, pls. xiii–xv (December, 1893). [II, B, ii, a, b, d : F, iii, c; v, d. III, A. IV, C, D, E.]

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155. ——. Ueber eine abnorme *Cucumaria planci*. Zeitschr. wiss. Zool. liii. Suppl. Bd. pp. 21–30, pl. iv (May, 1892). [II, B, ii, e.]

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156. ——. Vorläufiger Bericht über die auf den Tiefsee-Fahrten des "Albatross" (Frühling, 1891) im ostlichen Stillen Ocean erbeuteten Holothurien. Zool. Anz. xvi, pp. 177–186 (May, 1893). [II, B, i, b, 4 : D, vi : F, ii. III, A. IV, B.]

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156A. ——. Reports on the Dredging Operations . . . carried on by the U. S. Fish Commission Steamer "Albatross" during 1891. . . . IV. Vorläufiger Bericht ueber die erbeuteten Holothurien. Bull. Mus. Harvard, xxiv, No. iv, pp. 105–114 (June, 1893).

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159. ——. The development of the genital organs, pseudo-heart (ovoid gland), axial and aboral sinuses in *Amphiura squamata*. Zool. Anz. xv, pp. 234–237 (June, 1892). [II, B, i, e, 4 : F, v, c.]

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160. The Organogeny of *Amphiura squamata*. Reply to a criticism of Mons. L. Cuénot. Zool. Anz. xv, pp. 449–451 (December, 1892).

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161. ——. The development of the dorsal organ, genital rachis, and genital organs in *Asterina gibbosa*. Zool. Anz. xvi, pp. 169–173 (May, 1893). [II, F, iv, a.]

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162. MARCHISIO, P. Intorno agli *Echinaster doriæ* e *tribulus* De-Filippi e all' *Astropecten aster* De-Filippi. Boll. Mus. Torino, viii (May, 1893). [II, B, ii, b.]

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164. ——. Contribution à l'étude des Holothuries de l'Atlantique du Nord (Golfe de Gascogne, Isles Açores). Result. Comp. Scientif. Prince de Monaco. Fasc. vi, 22 pp., 2 pls. (1893). [II, B, ii, b : F, ii. III, A. IV, B.]

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165. ——. Veröffentlichungen der Commission für Erforschung des Östlichen Mittelmeeres. (Vorläufige Mittheilung.) Neue Echinodermen aus dem Mittelmeere. SB. Ak. Wien, cii, Abth. i, pp. 66–70 (April, 1893). [III, A. IV, B, D.]

166. ——. Zoologische Ergebnisse der Tiefsee-Expeditionen im östlichen Mittelmeere auf S.M. Schiff "Pola." I. Echinodermen, gesammelt 1890, 1891 und 1892. Anz. Ak. Wiss. 1893, No. viii, pp. 65–67 (March, 1893). [II, D, vii.]

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167. ——. Ueber die Identität des "Cottonspinner" (*Holothuria nigra*) der Engländer mit *Holothuria forskalii* Chiaje und das Vorkommen von *Cucumaria koellikeri* Semp. im Atlantischen Ocean. Anz. Ak. Wiss. xxx, pp. 107–109 (May, 1893). [III, A. IV, B.]

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[MARENZELLER, E. VON.] [See also STEINDACHNER (254).]

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169. MARSHALL, W. Brehms Tierleben . . . Dritte Auflage, x. Die Niederen Tiere, von . . . O. Schmidt . . . neubearbeitet. Die Stachelhäuter (*Echinodermata*), pp. 495–540. Leipzig und Wien: 1893, 8vo. [II, B, i, a, 1 : D, i.]

170. ——. Ueber Autotomie oder Selbstverstümmelung bei Thieren. SB. Ges. Leipzig, 1888–89, pp. 86 & 87 (1889). [II, D, vii ; viii.]

171. MARTENS, E. VON. Echinodermen aus Neu Guinea. SB. Ges. naturf. Berlin. 1889, pp. 183–185 (Nov. 1889). [II, B, ii, d : D, viii. III, A. IV, C, D, E.]

172. ——. "Ein vierzähliger Seestern (*Asteriscus verruculatus*, M. Tr.)." *Op. cit.* 1891, p. 148. [II, B, ii, d.]

173. MATZDORFF, C. Ueber schmarotzende Protozoen. Helios, x, pp. 10–12 (May, 1892).

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174. ——. Commensalisten und Parasiten von Echinodermen. *T. c.* pp. 90–92 (Feb. 1893).

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175. MAYER-EYMAR, C. Ueber Neocomian Versteinerungen aus dem Somali-Land. Vierteljahrschr. Ges. Zurich, xxxviii, pp. 249–265, pls. i & ii (1893). [III, B, iii. IV, C.]

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177. ——. Echini del Mar Rosso dragati nella campagna idrografica della R. Nave "Scilla" nel 1891–92. Atti Soc. Modena (3) xii, p. 100 (1893). [III, A. Names only.]

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180. [MEISSNER, M.] Bericht ueber die wissenschaftlichen Leistungen in der Naturgeschichte der Echinodermen während des Jahres 1889. Arch. Naturg. lv (II, 3), pp. 135–160 (Nov. 1893).

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182. ——. Ueber *Parasalenia gratiosa*, A. Ag. von Madagaskar. *T. c.* pp. 185 & 186 (Nov. 1892). [II, B, ii, d. III, A.]

183. MEUNIER, S. Traité de Paléontologie pratique, Gisement et Description des Animaux et des Végétaux fossiles de la France, Indication de Localités fossilifères, &c. Paris: 1893, 8vo, pp. xi & 495, 2 maps, text illustr. [Foss. *Echinoderma*, pp. 268–286.]

184. MICHAEL, R. Cenoman und Turon in der Gegend von Cudowa in Schlesien. Zeitschr. deutsch. geol. Ges. xlv, pp. 195–252 (Oct. 1893). [III, B, iii.]

185. ——. *Encrinus* sp., von Chorulla, Ober-Schlesien. *T. c.* pp. 500–502 (1893). [III, B, iv. IV, F.]

185A. MILLER, S. A. The Structure, Classification, and arrangement of American Palæozoic Crinoids into families. Rep. Indiana Geol. 1888, pp. 302–326. (Dated 1889, published 1891.)

A reprint of MILLER (2) Zool. Rec. 1891.

186. ——. Palæontology. Rep. Indiana Geol. xvii, pp. 611–705, pls. i–xx (1892).

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187. ——. Palæontology. *Op. cit.* xviii, pp. 257–356, pls. i–xii. (Advance sheets published in September, 1892; Report issued in 1894.) The pagination hereinafter followed is that of the first publication, viz., pp. 1–79. [III, B, iv. IV, F, G.]

187A. MILLER, S. A., & GURLEY, W. F. E. Description of some new genera and species of *Echinodermata* from the Coal Measures and Subcarboniferous Rocks of Indiana, Missouri, and Iowa. Rep. Indiana Geol. 1888, pp. 327–373. (Dated 1889, published 1891.)

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188. —— & ——. Description of some new species of Invertebrates from the Paleozoic Rocks of Illinois and adjacent States. Bull. Illinois Mus. No. 3, 81 pp., 8 pls. (Dec. 1, 1893). [III, B, iv. IV, C, F, H.]

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189. [MINCHIN, E. A.] Observations on the Gregarines of Holothurians. Quart. J. Micr. Sci. (n.s.) xxxiv, pp. 279–310, pls. xxvii & xxviii (Jan. 1893). [II, D, viii.]

Contains a criticism of CUÉNOT (60) pp. 306 & 307. Abstract, J. R. Micr. Soc. 1893 (April), p. 197.

190. MOBERG, J. C. Om Lias i sydöstra Skåne. Svenska Ak. Handl. xxii, No. 6, 87 pp., 4 pls. (1888). [IV, C, F.]

191. MOEBIUS, K. Ueber die Thiere der schleswig-holsteinischen Austernbänke, ihre physikalischen und biologischen Lebensverhältnisse. SB. Ak. Berlin, 1893, pp. 67–92 (Feb. 1893). [III, A.]

192. MOESCH, C. Beschreibung der Kalk- und Schiefergebirge des Nordwestlichen Kartengebietes von Blatt XVIII, &c. Beitr. geol. Karte Schweiz. xxi, Part ii, viii & 49 pp., 1 pl. (1893). [III, B, iii.]

193. MONTICELLI, F. S. Notizia preliminare intorno ad alcuni inquilini degli Holothurioidea del Golfo di Napoli. Monit. Zool. ital. iii, pp. 248–256 (Dec. 1892). [II, D, viii.]

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194. MOORE, J. E. S. Mammalian spermatogenesis [compared with Echinoderm]. Anat. Anz. viii, pp. 683–688 (Aug. 1893). [II, F, i, c.]

195. MORGAN, T. H. Growth and Metamorphosis of *Tornaria*. J. Morphol. v, pp. 407–458, pls. xxiv–xxviii (Dec. 1891). [II, F, i, e.]

Abstract, J. R. Micr. Soc. 1892, pp. 211–222.

196. ——. Experimental Studies on Echinoderm Eggs. Anat. Anz. ix, pp. 141–152 (Dec. 1893). [II, F, vii.]

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——. [See also BOVERI (25).]

197. MORTENSEN, T. Ueber *Ophiopus arcticus* (Ljungman), eine Ophiure mit rudimentären Bursae. Zeitschr. wiss. Zool. lvi, pp. 506–528, pls. xxv & xxvi (Sept. 1893). [II, B, i, e, 2-6 : F, v, b.]

Abstract, J. R. Micr. Soc. 1894 (Feb.) p. 67.

MUNIER-CHALMAS. [See JANET (128).]

198. NEUMAYR, M., & UHLIG, V. Ueber die von H. Abich im Kaukasus gesammelten Jurafossilien. Denk. Ak. Wien, lix, pp. 1–122, pls. i–vi (1892). [III, B, iii.]

199. NEVIANI, A. Ancora sulla filogenesi degli Echinodermi. Riv. ital. Sci. Nat. xii, pp. 17–19 (Feb. 1892). [II, A.]

200. ——. Sulla *Ophioglypha* (*Acroura*) *granulata* Beneck Sp. del Muschelkalk di Recoaro. Boll. Soc. geol. Ital. xi, pp. 214–221, pl. iii (1893). [IV, E.]

201. NORDGAARD, O. Enkelte track af Beitstadfjordens evertebratfauna. (*Polyzoa, Echinodermata, Hydroidæ.*) Bergens Mus. Aarbog, 1892, No. 2, 11 pp. (1893).

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202. NORMAN, A. M. *Holothuria nigra*, Gray, and its synonymy. Ann. Nat. Hist. (6) xii, pp. 409–411 (Nov. 1893.) [II, B, i, b, 2. IV, B.]

203. ——. A Month on the Trondhjem Fiord. [Part I.] *T. c.* pp. 341–367 (Nov. 1893). [III, A, ii, a.]

204. ——. *Cucumaria montagui* (Fleming) and its synonymy. *T. c.* pp. 469–473 (Dec. 1893). [II, F, ii. IV, B.]

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206. PARENT, H. Description de quelques oursins nouveaux de la craie blanche. Ann. Soc. geol. Nord, xx, pp. 8–21, pls. i & ii (1892). [II, F, iii, c. III, B, iii. IV, C.]

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(ix) **Echinoderms as food for Fish**:—*Amphiura* in *Pleuronectes platessa*, *P. limanda*, *P. cynoglossus*, *Hippoglossoides limandoides*, *Gadus æglefinus*, *G. merlangus*, *Trigla gurnardus*; *Ophioglypha* in *Pleuronectes platessa*, *P. limanda*, *Hippoglossoides limandoides*, *Gadus æglefinus*, *Raia clavata*, *G. morrhua*; *Amphidotus* in *Pleuronectes platessa*, *P. microcephalus*, *P. limanda*, *Hippoglossoides limandoides*, *Gadus æglefinus*;

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Ophiothrix in *Pleuronectes limanda* (*O. rosula*), *Hippoglossoides limandoides*, *Trigal gurnardus*, *Gadus morrhua*, *G. æglefinus*, *Anarrhichas lupus*; *Asterias* in *Hippoglossoides limandoides*, *G. æglefinus*; *Echinocyamus* in *Gadus æglefinus*; *Cucumaria* in *Gadus æglefinus*; *Echinus* in *Gadus æglefinus*; *Antedon* in *Pleuronectes microcephalus*: SMITH (252).—*Ophiothrix fragilis* in *Galeus canis*, *Gadus morrhua*; *Ophioglypha texturata* in *Galeus canis*, *Acanthias vulgaris*, *Trigla hirundo*, *Platessa vulgaris*, *Limanda vulgaris*; *Echinus miliaris* in *Trigla gurnardus*, *Platessa vulgaris*; *Echinocyamus pusillus* in *Platessa vulgaris*, *Rhombus lævis*, *R. maximus*, *Solea vulgaris*: SAUVAGE (235).—Echinoderms, chiefly *Ophiura* and *Ophioglypha*, with some Echinoids and occasional Holothurians, form the chief food of *Trigla lyra*, *Gadus æglefinus*, and *Pleuronectes limanda*; largely eaten by *Hippoglossoides limandoides*, *Pleuronectes platessa*, *P. microcephalus*, *P. cynoglossus*, and *Solea vulgaris*; occasionally by *Gadus morrhua*, *G. merlangus*, *Merluccius vulgaris*, *Scyllium canicula*, and *Raia batis*; rarely by *R. clavata*: HOLT (123).

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(iii) **Bibliography**:—*Crinoidea* of Gotland; BATHER (11).—Mesozoic *Echinoderma* of the United States; CLARK (36) pp. 15–20.—Iowa *Blastoidea* (p. 219), *Crinoidea* (p. 266), *Echinoidea* (p. 294), other *Echinoderma* (p. 291); KEYES (140).

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(d) Oviposition:—the time of, in *Toxopneustes variegatus*, *Hipponoë esculenta*, *Ophiocoma æthiops*, *Ophiothrix orsterii* ?, in Kingston Harbour, Jamaica; FIELD (82).

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(e) Larval stages :—Cleavage of Echinoderm ova compared with that of *Amphioxus*; WILSON (273).—Bilateral symmetry of larva independently acquired in the different classes ; KENNEL (132) p. 70.—The preoral lobe in Echinoderms ; SEELIGER (241) p. 409 : as an organ of fixation ; WILLEY (272) p. 331.—Adaptive modifications of the free-swimming larval forms contrasted with simple non-swimming larvæ ; PERRIER (213) p. 185.—Comparison of Tornaria of *Balanoglossus* with the Echinoderm larva; MORGAN (195) pp. 431–447.

(f) Tissue-formation :—Development of Mesoblast ; GREENOUGH (101). —Formation of stereom by skeletogenous cells in *Echinoderma* generally ; CHUN (34) : and in *Echinoidea* particularly ; THEEL (260).

(ii) *HOLOTHUROIDEA* :—(a) Ova :—large in *Benthodytes sanguinolenta* ; LUDWIG (156) p. 180.

(b) Larval Stages :—Habitat of embryos ; KENT (135) p. 229.

(c) Tissue-formation :—Growth of spicules, variant methods, in *Cucumaria montagui* ; NORMAN (204) p. 472.

(d) Senile characters :—in spicules of *Synapta digitata*; MARENZELLER (164) p. 18.

(iii) *ECHINOIDEA* :—(a) Formation of Gonads :—Spermatogenesis ; PICTET (218).—Early development and structure of ovum in *Sphærechinus* ; SCHNEIDER (237) p. 46.

(b) Larval stages :—Maturation, impregnation and segmentation of ovum, development of blastula, cells with plasmatic processes and sensory (?) cilia, of gastrula, formation of mesenchyme (with general discussion), the formation of calcareous deposits, development of pluteus and of young urchin, especially of spines, sphæridia and teeth, and of dorsal plate from rod of pluteus ; THEEL (260). — Segmentation in *Echinus microtuberculatus*, and teratological development of archenteron and mesoblast ; PENARD (210).—Normal development of skeleton in pluteus of *Sphærechinus* ; HERBST (118) p. 194.

(c) Brephic and Neanic stages :—of *Echinocyamus affinis*, *Coptosoma pellati*, *Circopeltis baicherei*, *Arachniopleurus arenatus* ; COTTEAU (44) : of *Echinothrix desori* (p. 362), *Asthenosoma varium* (p. 364), *Salmacis rarispina* (p. 370), *Laganum depressum* (p. 375) ; LORIOL (154): of *Diplopodia renevieri* (p. 61), and stages of growth in *Holaster latissimus* (p. 91) ; LAMBERT (145): of *Micraster gauthieri*, compared with adult ; PARENT (206) p. 13.

(iv) *ASTEROIDEA* :—(a) Larval stages and origin of organs :—Development of dorsal organ, genital organs, described in *Asterina gibbosa*, and compared with *Amphiura squamata* ; MACBRIDE (161).—Segmentation, origin of mesenchyme, mesoderm, and vaso-peritoneal vesicle in *Asterias glacialis*, compared with other Echinoderms ; RUSSO (229) p. 125.—Development of Bipinnaria in *Asterias glacialis* ; RUSSO (229) p. 131.

(b) Brephic stages :—of *Nymphaster florifer*, *Zoroaster angulatus*, *Z. carinatus* ; ALCOCK (6) pp. 94, 105 & 107.—Blood-vascular system in young *Asterias rubens* ; CHADWICK (30).

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(v) *OPHIUROIDEA* :—(a) General description ; FJELSTRUP (84) pp. 17–21.

(b) Formation of Gonads :—in *Amphiura squamata* ; RUSSO (230) p. 16.—Extrusion of ova in *Ophiopus arcticus* ; GRIEG (106) p. 17.—*Ophiopus* dies after its first and only extrusion of ova ; MORTENSEN (197) p. 526.

(c) Larval stages and origin of organs :—Segmentation, origin of germinal layers, vaso-peritoneal vesicles, water-vascular system, ovoid gland, skeleton, and nervous and digestive systems in *Amphiura squamata* ; RUSSO (230).—Embryonic development of genital organs, ovoid gland, axial and aboral sinuses in *Amphiura* ; MACBRIDE (159); CUÉNOT (59).—Apical system in *Ophioglypha nodosa* (p. 6), *Gorgonocephalus agassizi* (p. 10), and *G. lincki* (p. 11) ; GRIEG (105).

(d) Brephic and neanic stages :—of *Gorgonocephalus agassizi* ; GRIEG (106) p. 35 : of *Ophiothrix punctolimbata* ; LORIOL (154) p. 416.

(vi) *CRINOIDEA* :—(a) Formation of Gonads :—Oö- and spermatogenesis in *Bathycrinus carpenteri*, *Antedon petasus*, *A. prolixa*, and *A. eschrichti* ; DANIELSSEN (61) pp. 17–19.—Time and manner of oviposition in *Antedon* ; SEELIGER (241) p. 162.

(b) Larval stages :—Complete account of development of *Antedon rosacea* from ovum to cystid stage ; SEELIGER (241).

(c) Brephic and neanic stages :—Muscular articulation in brachials of young *Bathycrinus carpenteri* becomes syzygial in adult ; DANIELSSEN (61) p. 10.—Growth of stem in *Crinoidea* ; AGASSIZ (2) pp. 56–65.—Distal columnals of *Bathycrinus carpenteri* are in young formed of upper and lower halves united by syzygy ; DANIELSSEN (61) p. 3.—Neanic stages of *Gissocrinus verrucosus* ; BATHER (11) p. 172.

(vii) **Experimental investigation**:—Of early development of Echinoids, by chemical alteration of medium, fusion of two or more embryos into one individual (pp. 459 & 483), fission of one ovum into two individuals (p. 468), feeble development of skeleton, &c. ; HERBST (116) : similar investigation with Lithia-salts continued ; HERBST (118) : with chemical reagents on unfertilized eggs of *Sphærechinus* ; HERBST (117) : of segmentation in eggs of *Arbacia*, by salination of water ; LOEB (151) : by shaking, pressure, and salination, & of *Asterias* by shaking ; eggs of *Asterias forbesi* fertilized successfully with sperm of *Arbacia punctulata* ; MORGAN (196) : of segmentation of egg of *Echinoidea* by division of material ; DRIESCH (67) : by pressure, alteration of temperature and fragmentation ; DRIESCH (68) ; same continued and further development ; DRIESCH (70) : of ova of *Sphærechinus granulatus* and *Echinus microtuberculatus* by pressure ; relations of Ectoderm and Entoderm ; DRIESCH (69).—Driesch criticised ; BRAEM (26).

Fertilisation and segmentation of enucleated ova of *Echinoidea* ; BOVERI (25).—Conditions of keeping living larvæ of *Echinocyamus* (p. 3), different physiological reaction of ova from different environments (p. 6) ; THEEL (260).

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III.—DISTRIBUTION.

A.—GEOGRAPHICAL.

(i) General.

Geographical and bathymetric distribution of living *Echinoderma*, with lists of species, giving range in depth; Walther (268) pp. 296–328.

Comparison of deep-water *Echini* in Panamic and Caribbean districts; Agassiz (3) p. 80.

(ii) Atlantic.

(a) **North**: (1) Arctic Europe,—Spitzbergen, *Ctenodiscus*, *Asterias glacialis*, Ophiurids, *Strongylocentrotus droebachiensis*, *Echinus norvegicus*; Couteaud (51) p. 150.

(2) Scandinavian Waters,—Norway, Trondhjem Fjords; Nordgaard (201): simple list of species of all classes; Norman (203) pp. 346 & 349.—Bergen Fjords, names of species; Appellöf (8).—W. coast of Norway, list of Echinoderms dredged in July 1891; Buckley in Herdman (120).

Oyster-banks of Schleswig-Holstein and Helgoland, lists of Echinoderms; Moebius (191).—Detailed distribution of Echinoderms in Kattegat, and comparison with adjacent seas; Petersen (216).—Danish *Ophiuroidea*; Fjelstrup (84) pp. 21–30.

Baltic, eastern, *Asteracanthion rubens*, *Ophioglypha albida*; Kojevnikov (143) pp. 141 & 154.

(3) British area,—Horizontal, vertical, and topographical distribution of Echinoderms; Bell (16) pp. 175–187; for special distribution of species, see under names of species in body of same work.

Moray Firth, *Asteroidea*; Scott (240).—Coast of Scotland, *Astronyx loveni*, details and causes of distribution; Smith (251).—Firth of Forth, Scott (238).

Plymouth; Garstang (92).

Channel Is., list of *Echinoidea*; Sinel in Sharp (242) p. 64.—Pas-de-Calais, various Echinoderms; Hallez (112) p. 278.

(4) Main Ocean,—List of Crinoids and Echinoids as far as lat. 42° N.; Danielssen (61, 62): *Ophiuroidea*; Grieg (106).—Greenland, W. Coast, and Labrador, Ophiurids; Grieg (105).—North Atlantic, coast of Spain, and Azores, Holothurians, especially *Holothuria tremula*, *H. verrilli*, *Stichopus regalis*, *Pseudostichopus occultatus*, *Cucumaria abyssorum*, *C. montagui*, *Thyone inermis*, *Synapta digitata* at 150 metres, and *Chiridota abyssicola*, n. sp., at 2870 metres; Marenzeller (164).—Concarneau, *Cucumaria koellikeri*; Marenzeller (167).—Localities of Holothurians dredged by the "Hirondelle"; Marenzeller (163): of *Asteroidea*; Guerne (110).—New Brunswick, *Asterias forbesi*, *Molpadia turgida*, and *Chirodota tigillum*, added to list; Ganong (91).—Sargasso Sea, larvæ of littoral Asteroids, apparently thirty days old, found 1000 sea-miles from E. coast of Atlantic, and 3000 from W. coast, whence they probably came; Hensen (115) p. 25.

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(5) Mediterranean,—Eastern, various Echinoderms ; STEINDACHNER (254) p. 445.—*Luidia paucispina, Pentagonaster hystricis, Gnathaster mediterraneus, Pseudostichopus occultatus, Kolga ludwigi*, n. spp., *Ophioglypha carnea, Holothuria intestinalis*; MARENZELLER (165).—Cartagena, *Asterias glacialis, Echinaster sepositus* ; MEISSNER (179).—Sardinia, list of Echinoderms ; EFISIO (73) pp. 252 & 253.

(b) **Central and South** : (1) Jamaica, Kingston Harbour, principal Echinoderms ; FIELD (82).

(2) W. coast of Africa, list of *Echinoderma* and affinities of fauna ; STUDER (256) pp. 21 & 22.—Cape of Good Hope, list of *Echinoderma* dredged ; STUDER (256) pp. 53 & 54.—Cape Town, *Linckia multiforis, Asterina penicillaris* ; MEISSNER (179).

(3) Fernando Noronha, *Echinoidea* ; RIDLEY (222) p. 559.

(4) Kerguelen, *Cucumaria, Semperia, Chirodota, Trochostoma, Psolus, Thyone, Cidaris, Echinus, Hemiaster, Schizaster, Ophiogona, Ophioglypha, Ophiocten, Ophiocomis, Amphiura, Ophiacantha, Ophiomyxa, Gorgonocephalus, Pedicellaster, Asterias, Echinaster, Gnathaster, Porania, Leptoptychaster, Luidiaster, Pteraster, Retaster* ; STUDER (256) pp. 137, 142, & 163.

(5) W. Australia, Dirk Hartog I., *Antedon, Ophiocreas, Ophiuropsis, Pentagonaster* ; STUDER (256) p. 184.

(iii) PACIFIC AND ADJACENT OCEANS.

(a) **Australia** : Sydney, *Antedon macronema* ; Queensland, *Antedon tenera, Actinometra parvicirra, A. pectinata*, Bowen, *Antedon nematodon, A. afra* ; HARTLAUB (113).—Barrier Reef, *Holothuroidea* ; KENT (133, 135).—Torres Straits, *Antedon monacantha, A. tenera* ; HARTLAUB (113).—Sahul Bank, *Antedon longicirra, A. wood-masoni*, n. sp., *A. patula* and *Metacrinus interruptus* ; BELL (17).

New Guinea, Galewo Straits, Asteroids and Ophiuroids; STUDER (256) p. 233 : several species of Echinoids, Asteroids, and Ophiuroids already known from Indian Ocean ; MARTENS (171).

(b) **Malay Archipelago** : (1) Bay of Amboyna,—*Cidaris metularia, Rhabdocidaris annulifera, R. imperialis, Echinothrix desori, Diadema setosum, Asthenosoma varium, Salmacis rarispina, Tripneustes variegatus, Echinometra lucunter, Heterocentrotus mamillatus, Laganum depressum, Arachnoides placenta, Metalia maculosa, Maretia planulata, Astropecten polyacanthus, Luidia maculata, Pentaceros turritus, Pentaceropsis obtusatus, Culcita grex, Asterina cepheus, A. exigua, Linckia miliaris, Ophidiaster purpureus, Acanthaster echinites, Echinaster eridanella, Ophiopezella luetkeni*, n. sp., *Pectinura septemspinosa, P. gorgonia, P. infernalis, Ophiolepis cincta, Ophioplocus imbricatus, Ophiactis sexradia, O. brocki*, n. sp., *Amphiura duncani, Ophiocnida picteti*, n. sp., *Ophiocoma scolopendrina, O. erinaceus, Ophiarachna affinis, Ophiarthrum elegans, Ophiomastix annulosa, O. caryophyllata, Ophiothrix longipeda, O. comata, O. galateæ, O. bedoti*, n. sp., *O. picteti*, n. sp., *O. propinqua*, and others previously recorded from Amboyna ; LORIOL (154). *Antedon brocki, A. affinis, A. ludovici,*

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A. crassipinna, *A. claræ*, *A. oxyacantha*, *A. spinipinna*, *A. imparipinna*, *A. brevicuneata*, *A. elongata*, *A. perspinosa*, *A. nana*, *Actinometra divaricata*, *A. bennetti*, *A. regalis*, *A. coppingeri*, *A. pectinata*, *A. typica*; Hartlaub (113).

(2) Rest of Archipelago,—New Britain, *Antedon finschi*, *A. tenuipinna*; Ruck Is., *Actinometra fimbriata*, *A. pulchella*; Java, Noordwachter Eiland, *Antedon bella*; Pulo Edam, *Actinometra gracilis*; Lombok, *Actinometra parvicirra*; Sumatra, Atjeh, *Antedon milberti*; Singapore, *Antedon martensi*, *A. palmata*, *A. flagellata*; Hartlaub (113).

(c) **Indian Ocean**: (1) Deep waters, *Pararchaster*, *Pontaster*, *Dytaster*, *Persephonaster*, *Pseudarchaster*, *Porcellanaster*, *Styracaster*, *Hyphalaster*, *Astropecten*, *Dipsacaster*, n. g., *Pentagonaster*, *Miltcliphaster*, n. g., *Dorigona*, *Nymphaster*, *Paragonaster*, *Mediaster*, *Anthenoides*, *Palmipes*, *Chætaster*, *Zoroaster*, *Marsipaster*, *Hymenaster*, *Cribrella*, *Dictyaster*, *Pedicellaster*, *Asterias*, *Brisinga*, *Freyella*; Alcock (6).

(2) Bay of Bengal,—*Dipsacaster pentagonalis*, n. sp., *Calliaster mamillifer*, n. sp., *Astroschema flosculus*, n. sp., *Echinolampas castanea*, n. sp., *Brissopsis oldhami*, n. sp., *Lovenia gregalis*, n. sp., and others; Alcock (5).—*Antedon bengalensis*, *A. kraepelini*; Hartlaub (113).

(3) African coast & Islands,—Mauritius, *Cidaris curvatispinis*, n. sp.; Bell (19).—Mozambique Channel, *Georisia ornata*, n. sp.; Perrier (212).—Wapoo, *Antedon hupferi*; Hartlaub (113).—Madagascar, *Parasalenia gratiosa*; Meissner (182).—Zanzibar, *Goniodiscus sanderi*, n. sp., *Pentaceros muricatus*, *Asterina cepheus*; Meissner (179).—Cape Town and Zanzibar, *Echinoidea*; Meissner (181).

(4) Red Sea,—Holothurians; Herouard (121).—Various Echinoids; Boutan (24) iv, pp. 212, 352, & v, p. 53.—Mazzetti (177).—*Antedon palmata*; Koseir, *A. klunzingeri*; Hartlaub (113).

(d) **Main Ocean**: (1) Polynesia and S. America,—*Gymnasterias valvulata*, from Lord Howe's I., not from Lord Hood's I.; Bell (18) p. 28.—Anachorete Is., various *Echinoderma* (pp. 234 & 235), New Mecklenberg (p. 248), Neu-Pommern (p. 256), E. Australia (pp. 260–269), Magellan Str. (pp. 281, 283, 285–289, & 292), Timor (p. 216), Dampier Archipelago (pp. 191–197); Studer (256).

(2) Islands N. of Equator, — Fiji Is., *Actinometra parvicirra*, *A. stelligera*; Ovalau, *Antedon imparipinna*; Tonga Is., *Antedon palmata*, *A. imparipinna*, *A. serripinna*, *A. nana*, *Actinometra parvicirra*; Samoa, *Actinometra stelligera*; Hartlaub (113).

(3) S. America,—Callao and Tahiti, Echinoids; Meissner (181).—Callao, *Heliaster helianthus*, *Stichaster aurantiacus*, *Echinaster cylindricus*, *Asterina chilensis*, *Luidia bellonæ*; Meissner (179).—Chili, list of *Echinoidea*; Philippi (217).

(4) Caroline Is.,—Mortlock Is., *Antedon monacantha*, *Actinometra parvicirra*, *A. maculata*; Ponape, *A. parvicirra*; Hartlaub (113).

(5) Philippines,—Cebu Is., *Antedon erinacea*; near Philippines, Palau Is., *A. andersoni*; Hartlaub (113).

(6) China Sea,—*Actinometra solaris*, *Antedon crassipinna*, *A. impari-*

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pinna, *Actinometra macrobrachius* ; Formosa, *A. multiradiata* ; HARTLAUB (113).

(7) Eastern Pacific, — Holothurians, with new genera *Synallactes*, *Mesites*, *Meseres*, *Scotodeima*, *Laetmophasma*, *Capheira*, *Pelagothuria*, and *Sphaerothuria* ; LUDWIG (156).

Panamic region, deep-sea Echinoids, *Cystechinus*, *Aspidodiadema*, *Urechinus*, *Pourtalesia*, *Schizaster*, *Salenia*, and some *Cidaridæ* ; Ophiuroids, a few Ophiurans, *Ophiocreas*, *Sigsbeia* ; Asteroids, abundant, *Freyella*, *Hymenaster*, *Astrogonium*, *Asterina*, and *Archasteridæ* ; Holothuroids, *Elasipoda*, *Peniagone*, *Benthodytes*, *Euphronides* ; Crinoids, *Calamocrinus* ; AGASSIZ (3) p. 77.—Gulf of California, Echinoids, *Schizaster*, new genus allied to *Palæopneustes*, *Cystechinus*, *Pourtalesia* ; Ophiuroids, *Ophiomusium*, *Ophiocreas* ; Asteroids, *Brisinga*, *Cribrella*, *Astropecten* ; Holothuroids, *Elasipoda*, *Cucumaria*, *Trochostoma*, *Benthodytes*, *Euphronides* ; AGASSIZ (3) p. 78.

(8) Japan,—*Antedon conifera*, *A. japonica*, *A. multiradiata* ; HARTLAUB (113).—Echinoids ; MEISSNER (181).—Yokohama, *Asterias amurensis*, *A. torquata*, *Astropecten scoparius*, *Luidia limbata*, *Asterina pectinifera* ; Inland Sea, *Astropecten latespinosus*, n. sp. ; MEISSNER (179).

(9) N. E. Pacific,—Coast of British Columbia, *Strongylocentrotus franciscanus* ; WHITEAVES (270) p. 133.

B.—GEOLOGICAL.

(i) GENERAL.

Summary of fossil *Echinoderma* of France, with localities ; MEUNIER (183).

(ii) CAINOZOIC.

(a) **General** :—Distribution of *Astropecten* ; SACCO (233) p. 745.—Pianosa in Tyrrheno Sea, *Echinoidea* ; SIMONELLI (245).—(?), Turkestan, *Austinocrinus erckerti* ; ROMANOVSKII (223) p. 85. — Coro, W. Indies, *Scutella* ; ERNST (75) p. 339.—Australia,—*Echinoidea*, for new species see under *Psammechinus*, *Coptechinus*, *Fibularia*, *Progonolampas*, and *Cyclaster* ; BITTNER (21) pp. 368 etc., and TATE (257) : *Echinolampas morgani*, n. sp., and *Galeraster australiæ*, n. g. & sp. ; COTTEAU (39) pp. 546–548.

(b) **Pliocene** :—Piedmont, *Astropecten* and *Ophiotrix* ; SACCO (233).—E. Pyrenees, *Cidaris tribuloides* ; COTTEAU (42) p. 736.—Mexico, *Echinocyamus altavillensis*, *Clypeaster meridanensis*, *C. crustulum* ; AGUILERA (4) p. 43.—(?), New Guinea, *Temnechinus* and *Peronella* ; ETHERIDGE (76) p. 691.

(c) **Miocene** :—Angles in Gard, France, *Pentacrinus*, *cf. Gastaldii* ; SINARD (247).—Kralitz in Mähren, *Echinoidea* and *Asteroidea* ; TOULA (265) pp. 291 & 292.—(Helvetian), of Rhone basin, *Echinoidea* ; DEPÉRET (64).—(Middle Miocene), Maine-et-Loire, *Echinolampas dumasi*, n. sp. ; COTTEAU (46) p. 353.—Sinai, two *Echinoidea* ; ROTHPLETZ (224) p. 103.—Ilheu da Cal, Porto Santo, Madeira Archipelago, *Clypeaster altus* ;

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COTTER (49) p. 235.—Ilha de Santa Maria, Azores, *Clypeaster altus*; COTTER (50) p. 259.

(d) **Eocene** :— *Clypeastroïda*; COTTEAU (40). — *Cidaridæ*, list of species; COTTEAU (43).—Localities and complete species of *Scutellina*, *Echinocyamus*, *Lenita*, *Thagaster*, *Fibularia*, *Cidaris*, *Rhabdocidaris*, *Porocidaris*, *Salenia*, *Coptosoma*, *Cyphosoma*, *Leiosoma*, *Circopeltis*, *Micropeltis*, *Gagaria*, *Coelopleurus*, *Baueria*, *Echinopsis*, *Hebertia*, *Rhabdopleurus*, *Arachniopleurus*, *Triplacidia*, *Leiopedina*, *Echinopedina*, *Sphaerechinus*, *Psammechinus*, *Micropsina*, *Parasalenia*, also species of *Maretria*, *Euspatangus*, *Tuberaster*, *Echinocardium*, *Sarsella*, and *Breynia*; COTTEAU (44). —(Upper Eocene), Biarritz; *Cidaris feliciæ*, n. sp.; COTTEAU (42).—E. Balkans, *Echinocyamus subcaudatus*; TOULA (264) p. 450.—Vicentino, Italy, *Brissospatangus vicentinus*, n. sp.; MAZZETTI (176). — Victoria, localities of *Echinoidea* and *Antedon breviceps*; TATE & DENNANT (258) p. 225.—(Passage from Cretaceous couches à *Echinanthus*), Pyrenees, *E. heberti*, *E. carinatus*, *E. pouechi*, *E. ataxensis*, *E. rayssacensis*, *E. gracilis*, and other species of *Echinanthus*, *Horiolampas*, *Conoclypeus*, *Micraster*, *Hemiaster*, *Echinocorys*, and *Strictechinus*; ROUSSEL (226).

(iii) MESOZOIC.

(a) **General** :—*Echinodermata* of United States; CLARK (36), *passim* and special table on p. 94.

(b) **Cretaceous** :—N. Germany, *Cidaridæ* and *Salenidæ* (pp. 143, 203, & 209), and Regular Echinoids (p. 214); SCHLUETER (236).—*Epiaster* (?) sp. indet., in Glen Rose beds, Texas; HILL (122) p. 21.—(Upper Cretaceous), Haute-Garonne, *Strictechinus pouechi*, n. sp.; COTTEAU (42) p. 738.—Angoulême, horizons and localities of numerous Echinoids and *Pentacrinus carinatus*; ARNAUD (9).—*Micraster aff. aturicus et heberti*; FALLOT (77).—(Pyrope beds), Bohemia, *Antedon pyropa*, n. sp.; ZAHALKA (277).—(Upper Desert Sandstone), *Micraster sweeti*, n. sp.; ETHERIDGE (76) p. 559.—(Upper Cretaceous), Mexico, *Salenia prestensis*, *Pseudocidaris saussurei*, *Pseudodiadema malbosi* ?, *Cyphosoma texana*, *C. aquitanicum*, *Holectypus castilloi*, *Lanieria lanieri*, *Pyrina parryi*, *Toxaster elegans*, *Heteraster texanus*, *Enallaster mexicanus*, *E. delgadoi*, *Micraster* sp. ?, *Linthia* sp., *Ananchytes sulcatus* ?, *Macropneustes*, sp. ? ; AGUILERA (4) p. 26.—(Danien), Rivières near Tercis (Landes), *Dipneustes aturicus*, n. g. & sp.; COTTEAU (41).—Villagrains in Aquitaine, (Senonian) *Micraster aturicus*, *Echinocorys heberti*, *Echinoconus raulini*, (Danien) *Echinocorys vulgaris* (*acuminati*, var.), *Echinoconus gigas*, also other Echinoids of less importance; FALLOT (78) pp. 353–355.—(Senonian),—Lezennes, d'Estrée-Blanche, and Roisel, N. France, *Micraster beonensis*, *M. gauthieri*, and other species of *Micraster*, *Echinocorys*, *Echinoconus*, *Holaster*, and *Cidaris*; PARENT (208): all species of *Hemipneustes*; COTTEAU (38): France, *Circopeltis peroni*, n. sp.; COTTEAU (39) p. 537: Vernasso near Friuli, *Cidaris papillata*; TOMMASI (262) p. 1115: Tunis, *Pentacrinus peroni*, n. sp., *Balanocrinus africanus*, n. sp.; LORIOL (153): Algeria, *Hemiaster* and *Hemipneustes*, n. sp., *Echinobrissus subsitifensis*; FICHEUR (81) pp. 419–421.—

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(Upper Senonian, Lower Campanian), Charente-Inférieure, *Thylechinus* and *Cyphosoma rejaudryi*, n. spp.; COTTEAU (46) p. 349.—(Middle Dordonian), Charente Inférieure, *Salenia cylindrica*, n. sp., of Dordogne, *Orthechinus boreaui*, n. sp.; COTTEAU (46) pp. 346 & 350.—(Upper Senonian) Dordogne, *Hemipneustes arnaudi*, n. sp.; COTTEAU (42) p. 733.—(Hippurite Chalk) France, *Cidaris baussetensis*, n. sp.; COTTEAU (39) p. 545.—(Santonian) France, *Salenia radians*, n. sp.; COTTEAU (39) p. 543.—(Zones of *Micraster* and *Epiaster*) Boulonnais, *M. breviporus*, *M. cortestudinarium*, *M. corbovis*, *M. normanniæ*, *M.* n. sp., *Cardiaster granulosus*, *Cyphosoma* sp., and other *Echinoidea*; PARENT (207).—(Zone of *Micraster cortestudinarium*) near Lille, *Micraster gauthieri*, n. sp., *M. cayensi*, n. sp., *M. bucailli*, n. sp., *M. coranguinum*, var.; (Zone of *M. breviporus*), *M. sanctaemaurae*, *M. normanniæ*, *Echinoconus lezennensis*, n. sp.; PARENT (206).—(Zone of *M. cortestudinarium*) Lille, *Micraster gosseleti*, n. sp.; CAYEUX (29).—(Zone of *M. breviporus*), *Echinoidea*; CAYEUX (28).—(Turonian) Silesia, *Cidaris* sp., *cf. subvesiculosa*, *Micraster cortestudinarium*; MICHAEL (184) p. 242.—(Cenomanien),—Artois, N. France, various *Echinoidea*, names only; PARENT (209): Silesia, *Cidaris vesiculosa* and *C. reussi*; MICHAEL (184) p. 240: Algeria, *Hemiaster gabrielis* and *H. proclivis*, *Heterodiadema libycum*, *Codiopsis doma*, &c.; FICHEUR (81) pp. 411 & 412: rocks of Lebanon, proved of this age by *Echinoidea*; COTTEAU (47, 48): Sinai, various *Echinoidea*; ROTHPLETZ (224) p. 103.—(Priesener Schichten) Bohemia, *Antedon fischeri*, *Cidaris sceptrifera*, *C. subvesiculosa*, *Phymosoma radiatum*, *Micraster de lorioli*, *Holaster placenta*?, *Hemiaster regulusanus*, *Cupulaster pauper*, *Stellaster coombii*, *Ophioglypha*? *pulcherrima*; FRIČ (89) pp. 22, 61, & 109.—(Kieslingswalder Gestein) Silesia, *Cardiaster cotteanus*, *Schizaster roemeri*, *Asterias schulzii*; LANGENHAN & GRUNDEY (147) p. 8.—(Aptian, Albian, Cenomanian, Senonian, Maestrichtian) Central Pyrenees and Corbières, lists of *Echinoidea*; ROUSSEL (225).

Lower Cretaceous.—(Berriasschichten) Margofelalpen and "Auf der Schöni," Switzerland, *Cidaris alpina*; MOESCH, (192) p. 7.—(Rolling Downs Formation), *Pentacrinus australis*; ETHERIDGE (76) p. 439.—(Gault) Artois, N. France, *Catopygus*, *cf. cylindricus*, *Cidaris gaultina*, *C. cf. salevensis*, *C. vesiculosa*; PARENT (209).—(Neocomian) Spain, *Cidaris pyrenaica*; COTTEAU (39) p. 542: Balkans, *Pentacrinus neocomiensis* and *Pyrina* sp.; VANKOV (266) p. 97: Somaliland, *Toxaster collegnoi*, *Pygaulus kelleri*, *P. barthi*; MAYER-EYMAR (175) p. 261.—(Aptien, Sables ferrugineux) Grandpré, France, *Cidaris plexa*, n. sp., *Goniocidaris farringdonensis*, *G. arduennensis*, n. sp., *Diplopodia renevieri*, *Polydiadema cotteaui*, n. sp., *Hemidiadema rugosum*, *Peltastes lardyi*, *Discoides peroni*, n. sp., *Phyllobrissus cerceleti*, *Holaster latissimus*, *Echinospatangus breyniusi*; LAMBERT (145).

(c) **Jurassic**:—Caucasus, see under *Acrochordocrinus*, *Pentacrinus*, and *Rhabdocidaris*; NEUMAYR & UHLIG (198).—Mexico, *Millericrinus polyclonos*, *Cidaris submarginata*, *Acrocidaris nobilis*; AGUILERA (4) p. 17.—(Upper Jurassic) Poland, *Apiocrinus milleri*, *Pentacrinus desori*, *P. ambly*

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scalaris, Sphæraster punctatus, Cidaris coronata, C. propinqua, C. florigemma, C. filograna, C. abichi, Rhabdocidaris remus, R. suevica, R. nobilis, R. caprimontana, Stomechinus aroviensis, Hyboclypeus sp., *Echinobrissus goldfussi, Collyrites thermarum, Dysaster siliceus*; SEMIRADZKI (244) pp. 142–144. — (Tithonian) Crimea, *Phyllocrinus verrucosus*, n. sp., and Echinoid fragments; RETOWSKI (221) p. 288: Algeria, at Soubella and Teniet-Afghan, *Holectypus afer, Infraclypeus thalebensis, Metaporhinus convexus, Collyrites carinata*; FICHEUR (81) p. 401.—(Kimmeridgian and Oxfordian, Katrol and Charee Groups) Cutch, India, *Cidaris* sp., *Rhabdocidaris* sp., *Pseudocidaris unigranulatus*, n. sp., *Pseudodiadema cutchensis*, n. sp., *Stomechinus* sp., *Holectypus sarthacensis, Collyrites dorsalis, C., cf. bicordata, Pygorhytis tumulus*, n. sp.; GREGORY (102) p. 2: of Kahlberg, near Echte, Germany, list of *Echinoidea*; SMITH (250) p. 346.—(Sequanian, Couches de Ste. Verene) Oberbuchsiten, Switzerland, *Cidaris florigemma, C. blumenbachi, C. coronata, Diplocidaris gigantea, Hemicidaris intermedia, Acrocidaris nobilis, Apiocrinus meriani, Pentacrinus desori, Balanocrinus sigmaringensis*; GREPPIN (104) pp. 99 & 105.—(Oxfordian) Brünn, *Pentacrinus briareus*, with *P. subteres, P. cingulatus*, and *Eugeniacrinus hoferi*; ZIMMERMAN (279).

(Oolite, Nattheim-kalk) Swabia, *Solanocrinus* and *Eugeniacrinus*; ENGEL (74).—(Middle and Upper Oolites) Yorkshire, lists of Echinoderms; FOX-STRANGWAYS (87), I, pp. 276, 302, 314, 322, 324, 334, 340, 347, 355, 359, 363, 377, and II, pp. 193–199.—(Lower Oolites) Yorkshire, lists of Echinoderms; FOX-STRANGWAYS (87), I, pp. 152, 177, 209, 214, 249, 264, and II, pp. 144–146.—(Between Bajocian and Bathonian) Maine-et-Loire, *Pedina grossouvrei*, n. sp.; COTTEAU (46) p. 344.—(Stufenstein) Switzerland, *Cidaris filograna* and *C.* sp.; MOESCH (192) pp. 27 & 28.—(Inferior Oolite, Untere Hauptrogenstein) near Basle, contains banks of *Cainocrinus andreæ*; *Terebratula maxillata* beds are rich in *Hemicidaris langruensis*; Discoideen-mergel or Cornbrash contains *Holectypus depressus, Echinobrissus clunicularis*, and *Clypeus sinuatus*; GREPPIN (103).

(d) **Lias**:—England and Wales, except Yorkshire, general list of Echinoderms; WOODWARD (276) pp. 369 & 370.—Yorkshire, lists of Echinoderms; FOX-STRANGWAYS (87), I, pp. 37, 45, 49, 53, 60, 79, 84, 126, 130, and II, pp. 32-36.—(Toarcian) May in Calvados, *Hemicidaris bigoti*, n. sp.; COTTEAU (46) p. 345: Dives in Calvados, *Pentacrinus basaltiformis* and *Eugeniacrinus deslongchampsi*; LIPPMANN & DOLLFUS (150) p. 390.—(Middle Lias) Lothringen, *Pentacrinus basaltiformis, P. subsulcatus, P. oceani, Extracrinus subangularis*; STUBER (255): (?) Kurremölla in Scania, *Pentacrinus* and *Cidaris*; MOBERG (190) pp. 23–27.—(Lower Lias) Lothringen, *Pentacrinus psilonoti, P. tuberculatus, Cyclocrinus hausmanni, Cidaris martini, C., cf. ityx, Pseudodiadema minutum*; STUBER (255): Swabia, *Pentacrinus angulati*, n. sp., and *Ophiura turneri*, n. sp., &c.; ENGEL (74): Gamchilücke, Switzerland, *Pentacrinus tuberculatus*; MOESCH (192) p. 35: Ugliancaldo and Resti, Italy, *Pentacrinus*; FUCINI (90) p. 294: Calabria, *Echinoid* spines and *Pentacrinus* columnals; GRECO (100) p. 79.

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(e) **Rhaetic**:—Montagna di Cetona, Italy, *Hemicidaris* and *Cidaris* spines; SIMONELLI (246) p. 243.

(iv) PALÆOZOIC.

(a) **General**:—Cornwall, various ill-determined Crinoids; COLLINS (37) p. 49.

(b) **Trias**:—Saxony, list of fossils; GEINITZ (96) 190.—(Muschelkalk) *Holocrinus*; JAEKEL (126).—Recoaro, *Ophioglypha granulata*; NEVIANI (200).—(Muschelkalk, Gorasdzer Schichten) Chorulla, Upper Silesia, *Encrinus*, sp.; MICHAEL (185).—(St. Cassian beds) S. Tyrol, species of *Encrinus*, *Pentacrinus*, *Cidaris*, and *Rhabdocidaris*; OGILVIE (205) p. 50.

(c) **Permian**:—Saxony, list of fossils; GEINITZ (96) p. 178.

(d) **Permo-Carboniferous**:—Queensland, species doubtfully referred to *Actinocrinus*, *Platycrinus*, *Stemmatocrinus*, *Poteriocrinus*, *Mesoblastus*, *Granatocrinus*, *Tricœlocrinus*, and *Archæocidaris*; ETHERIDGE (76) pp. 207–213.

(e) **Carboniferous**:—*Palechinus sphæricus*, forming a bed at Chanxhe and Comblain-au-Pont, Belgium; LOHEST (152).—Turkestan, *Cyathocrinus stellatus*, *Poteriocrinus maschatensis*, *Platycrinus hieroglyphicus*, *Rhodocrinus tuberculatus*, n. spp., mostly columnals; ROMANOVSKII (223) pp. 81–85.—(Lower Carboniferous) Donegal, *Homotœchus*; SOLLAS (253).—Character of Crinoid faunas in the rocks of Iowa; KEYES (139) pp. 61–67.

(Coal Measures) Missouri, *Hydreionocrinus subsinuatus* (p. 40), *H. noduliferus* (p. 41), *H. crassidiscus* (p. 43), *H. granuliferus* (p. 44), *Ulocrinus blairi* (p. 57), *U. occidentalis* (p. 58), *Æsiocrinus angulatus* (p. 59), *Eupachycrinus parvus* (p. 60), n. spp., MILLER & GURLEY (188).

(Kaskaskia Group) Indiana, *Zeacrinus bellulus* (p. 34), Virginia, *Z. obesus* (p. 35), Illinois, *Z. nitidus* (p. 36), Indiana, *Scaphiocrinus martinensis* (p. 38), *Onychocrinus parvus* (p. 52), Kentucky, *Granatocrinus sphæroidalis* (p. 65), n. spp., MILLER & GURLEY (188).

(St. Louis Group) Indiana, *Melonites indianensis* (p. 5), Kentucky, *Oligoporus sulcatus* (p. 8), *Batocrinus lyonanus* (p. 18), Missouri, *Hydreionocrinus sanctiludovici* (p. 40), Illinois, *Talarocrinus trijugis* (p. 45), n. spp., MILLER & GURLEY (188).

(Keokuk Group) Missouri, *Oligoporus blairi* (p. 6), *O. bellulus* (p. 7), Indiana, *Actinocrinus gibsoni* (p. 10), Illinois, *A. angustatus* (p. 11), Iowa, *Cyathocrinus andersoni* (p. 30), Indiana, *C. tumidulus* (p. 31), *C. signatus*, (p. 32), *Barycrinus formosus* (p. 33), *Scaphiocrinus arrosus* (p. 39), Kentucky, *Forbesocrinus pyriformis* (p. 47), Indiana, *Taxocrinus crawfordsvillensis* (p. 49), *Goniasteroidocrinus lyonanus* (p. 55), n. spp., MILLER & GURLEY (188).—Missouri, n. spp. of *Agelacrinus*, *Platycrinus*, *Batocrinus*, Indiana, n. spp. of *Rhodocrinus*, *Steganocrinus*, *Batocrinus*, *Eretmocrinus*, *Cyathocrinus*, *Scaphiocrinus*, *Barycrinus*, Kentucky, *Ichthyocrinus*; MILLER (187).—Iowa, *Eupachycrinus orbicularis* (p. 31); WHITFIELD (271).

(Burlington Group) Iowa, *Batocrinus laura* (p. 17), *Eretmocrinus attenuatus* (p. 18), other Crinoids and one Blastoid previously described

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by Hall from this locality, and *Batocrinus bisbrachiatus*, n. sp. (p. 13); WHITFIELD (271): *Actinocrinus arrosus* (p. 15), *A. plagosus* (p. 16), *Eretmocrinus cassedayanus* (p. 17), *Strotocrinus venustus* (p. 26), Illinois, *Actinocrinus erraticus* (p. 14), *Granatocrinus winslowi* (p. 66), n. spp.; MILLER & GURLEY (188): *Teleiocrinus ægilops* (p. 20), Missouri, *Batocrinus oblatus* (p. 12); WHITFIELD (271): *Batocrinus altiusculus* (p. 20), *B. aspratilis* (p. 21), *B. scyphus* (p. 23), *B. lætus* (p. 24), *B. æquabilis* (p. 25), n. spp.; MILLER & GURLEY (188): n. spp. of *Actinocrinus*, *Dorycrinus*, *Batocrinus*; MILLER (187): *B. shepardi*, n. sp.; ROWLEY (228).

(Kinderhook Group) Missouri, *Blairocrinus spinosulus*, n. sp., p. 28; MILLER & GURLEY (188).

(Chouteau Limestone) Missouri, n. spp. of *Platycrinus*, *Actinocrinus*, *Blairocrinus*, *Agaricocrinus*; MILLER (187).—*Platycrinus allophylus*, *P. insolens*, *Blairocrinus*, *Granatocrinus roemeri*, and *G.* sp.; ROWLEY (227). —*G. mutabilis*, n. sp.; ROWLEY (228).

(f) **Devonian**:—(Hamilton Group) Missouri, *Melocrinus gregeri*, *Taxocrinus concavus*, n. spp.; ROWLEY (228).

(Upper Helderberg Group) Kentucky, *Nucleocrinus greenei* (p. 62), Kentucky and Ohio, *N. venustus* (p. 63), n. spp.; MILLER & GURLEY (188).

(Lower Oriskany) New York, *Edriocrinus sacculus*; BEECHER & CLARKE (14).

(Lower Devonian, Hauptquarzit) Klostergrunde in Harz, *Ctenocrinus*; KAYSER (131) p. 67. Haupt-Kahlebergrandstein, Harz, *Aspidosoma*; HALFAR (111A).

(g) **Silurian**:—Gotland, the *Crinoidea Inadunata* compared with those of England and America; BATHER (11), *passim* and esp. pp. 6 & 15.—Stratigraphy of Central Bohemia with special reference to Crinoids and Cystids, of which many nomina nuda are quoted; JAHN (127).

(Niagara Group) Indiana, n. spp. of *Holocystis*, *Æthocystis*, *Stribalocystis*, *Stephanocrinus*, *Saccocrinus*, *Cylicocrinus*, *Melocrinus*, *Gazacrinus*, *Cyphocrinus*; MILLER (187).—Tennessee, *Eucalyptocrinus wortheni*, n. sp.: MILLER & GURLEY (188) p. 53.

IV.—SYSTEMATIC.†

(A.)—ECHINODERMA IN GENERAL.

General classification; AGASSIZ (2) p. 8: the following is given by PERRIER (213) pp. 846–864 :—

I. Sub-series *Palæoechinodermata* : I Class, *Cystidea*; II Class, *Blastoidea*.
II. Sub-series *Neoechinodermata* : 1. Branch, *Anangia*; I Class, *Stelleroïda* (= *Asteroidea*); II Class, *Ophiuroïda*; 2. Branch, *Angiophora*; I Class, *Crinoïda*; II Class, *Echinoïda*; III Class, *Holothurides*.

† A dagger prefixed to the trivial name of a species indicates that it is fossil; prefixed to the name of the author, it denotes that the reference is to the species in a fossil state; prefixed to the name of a genus, it indicates that all species of the genus here recorded are fossil, and the † is therefore not repeated before each name. The abbreviations *l. c.* and *op. cit.* refer only to the place or work quoted *immediately* before.

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The chief divisions diagnosed ; BELL (16) p. 12 : see also Zool. Rec. 1891, BELL (5) p. 46.

(B.)—HOLOTHUROIDEA.

†*Holothurian* ?, intestine, preserved fossil ; FRIČ (89) p. 114.

Actinopyga echinites, characters of living animal, p. 236, *A. lecanora*, ditto, p. 235, *A. mauritiana*, ditto, pp. 229 & 236, *A. obesa*, ditto, p. 235 ; KENT (135).

A. mamillata, p. 56 [see under *Holothuria mammifera*], *A. polymorpha*, p. 236, Great Barrier Reef, KENT (135), n. spp.

Anapta fallax, Lamp. ; STUDER (256) p. 287.

Ancyroderma spinosum, nomen nudum ; LUDWIG (156) p. 185.

Benthodytes ; AGASSIZ (3) pp. 77, 79, 83, & 84. *B. gelatinosa*, Walsh, referred to *Pælopatides*, p. 178, *B. incerta*, nomen nudum, p. 179, *B. sanguinolenta*, Theel, anatomical details corrected, p. 180; LUDWIG (156). *B.* (?) *typica*, Theel, Azores ; MARENZELLER (164) p. 12.

B. janthina, between Pico and São Jorge, Azores, 2870 metres, MARENZELLER, Bull. Soc. Zool. France, xvii, p. 64, and (164) p. 10, n. sp.

Bohadschia argus, colour and commercial value, photo from life ; KENT (135) p. 56.

Capheira, n. g. of *Elasipod*, and *C. sulcata*, nomen nudum ; LUDWIG, Zool. Anz. xvi, p. 181.

Caudina californica, nomen nudum ; *op. cit.* p. 185.

Chirodota contorta, Ludw., p. 287, *C. panaensis*, Semp., p. 215 ; STUDER (256). †*C.* sp. ; WOODWARD (276) p. 370. *C. studeri*, Theel, distribution ; STUDER (256) pp. 140, 163, 283, & 285. *C. tigillum*, Selenka ; GANONG (91) p. 58.

C. abyssicola, Azores, 2870 metres, MARENZELLER (164) p. 19, and (163) p. 65, n. sp.

Colochirus, see *Pentacta*. *C. anceps*, colour and habits of feeding ; KENT (135) p. 241. *C.* (?) *andersoni*, Lamp. ; BELL (16) p. 46. *C. australis*, Ludw. ; STUDER (256) p. 192. *C. dispar*, Lamp., *C. inornatus*, Marenz., pp. 191, 192, 193 ; STUDER (256). *C. lacazei*, Hér., see *Cucumaria montagui*. *C. quadrangularis*, Less., p. 191, *C. tuberculosus*, Quoy Gaim., colour varying with locality, p. 191 ; STUDER (256).

Cucumaria, Forbes ; AGASSIZ (3) pp. 79 & 83, BELL (16) p. 35. *C. abyssorum*, Theel, the varr. *hyalina* and *grandis* are young and old respectively ; LUDWIG (156) p. 184 : Azores, 2870 metres, var. approaching var. *hyalina* ; MARENZELLER (164) p. 14. *C. andrewsi*, Farran ; BELL (16) p. 41. *C. crocea*, Less., brood-pouches, distribution ; STUDER (256) pp. 140 & 163. *C. frondosa*, Gunn. ; BELL (16) p. 39, NORDGAARD (201) pp. 5, 10 : spermato- and oögenesis ; CUÉNOT (57). *C. fucicola*, F. & G. ; BELL (16) p. 40. *C. hispida*, Barr. ; BELL (16) p. 38. *C. hyndmani*, Thomps. ; BELL (16) p. 36 : off coast of Spain ; MARENZELLER (164) p. 14. *C. koellikeri*, Semp. ; MARENZELLER (167) : spicules described and distinguished from *C. montagui* ; NORMAN (204) p. 472. *C. lacazei*, Herouard, see *C. montagui*.

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C. lactea, F. & G.; BELL (16) p. 38: var.?; PETERSEN (216) p. 39. *C. lefevrii*, Barrois, referred to *O. koellikeri*; MARENZELLER (167): see also *C. montagui*. *C. leonina*, Semp.; STUDER (256) p. 283 & 285. *C. montagui*, Flem., Pico Fayal, Azores, 130 metres, discussed and compared with *Colochirus lacazei*; MARENZELLER (164) p. 15, and (167): redescribed while *C. lefevrii*, *Semperia drummondi*, (?) *Thyone portlocki*, and (?) *C. lacazei* are referred to it; NORMAN (204) p. 469. *C. nigra* (Couch), Kinahan, see *Holothuria forskahli*. *C. planci*, Gmel.; BELL (16) p. 37: spermatogenesis; FIELD (83): alimentary canal; FRENZEL (88) p. 93: abnormal regeneration; LUDWIG (155): with *Ophryotrocha* as inquiline; MONTICELLI (193) p. 250. *C. pentactes*, Mont.; BELL (16) p. 37, PETERSEN (216) p. 39, STUDER (256) p. 29: teratological; TOPSENT (263). *C. serrata*, Theel, distribution; STUDER (256) p. 163.

Deima; AGASSIZ (3) p. 84. *D. pacificum*, nomen nudum; LUDWIG (156) p. 180.

Euphronides; AGASSIZ (3) pp. 77, 79, & 84.

E. tanneri, *E. verrucosa*, E. Pacific, LUDWIG Zool. Anz. xvi, p. 179, n. spp.

Georisia, n. g., type *G. ornata*, n. sp., Mozambique Channel, a bilateral and caudate Psolid; PERRIER, C.R. Ac. Sci. cxvi, p. 557: a syn. of *Psolidium* (*teste* LUDWIG).

Holothuria, Goldf.; BELL (16) p. 48. *H. albiventer*, Semp., spicules figured, includes *H. boxensis*, Ludwig, *H. aculeata*, Semper, and *H. modesta*; HEROUARD (121) p. 135. *H. argus*, Jaeg., characters of living animal; KENT (135) p. 237: extrusion of Cuvierian organs; STUDER (256) pp. 234 & 248. *H. aspera*, Bell; BELL (16) p. 50. *H. atra*, Jäg.; STUDER (256) pp. 191 & 234: habits and commercial value, characters of living animal; KENT (135) pp. 55, 121, & 238. *H. botellus*, characters of living animal; KENT (135) p. 238. *H. catanensis*, Grube, see *H. forskahli*. *H. coluber*, Semper, Barrier Reef, Queensland; KENT (133) pl. ii, fig. 1: colour and commercial value, photo from life, habits; KENT (135) pp. 56, 121, & 238. *H. edulis*, characters of living animal; KENT (135) p. 237. *H. forskahli*, Delle Ch.; MARENZELLER (167): redescribed and name restored for *H. nigra*, Auctt.; NORMAN, Ann. Nat. Hist. (6) xii, p. 409. *H. fusco-cinerea*, characters of living animal; KENT (135) p. 237. *H. impatiens*, Forskal; HEROUARD (121) p. 134: characters of living animal; KENT (135) p. 237. *H. intestinalis*, A. & R.; BELL (16) p. 48, NORDGAARD (201) pp. 5 & 10, STEINDACHNER (254) p. 446: E. Mediterranean; MARENZELLER (165) p. 66. *H. ludwigi*, Lamp.; STUDER (256) p. 256. *H. maculata*, Brandt, Suez, spicules figured; HEROUARD (121) p. 133. *H. nigra*, auctt.; BELL (16) p. 49, GARSTANG (92) p. 335: parasitic Gregarines; MINCHIN (189) p. 281: referred to *H. forskalii*; MARENZELLER (167). *H. pardalis*, Selenka, spicules figured, includes *H. martensi*, *juvenis* of Semper; HEROUARD (121) p. 134. *H. poli*, D.-Ch., with *Anoplodium pusillum* as inquiline; MONTICELLI (193) p. 250: spermatogenesis; FIELD (83). *H.*

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sanctorii, Della Chiaje, discussed; MARENZELLER (164) p. 7. *H.* sp.; FIELD (82) p. 83. *H. tremula*, Gunn.; BELL (16) p. 49, NORDGAARD (201) p. 5: N. of Spain; MARENZELLER (164) p. 9. *H. tubulosa*, Gmel.; EFISIO (73) p. 253: ovum described; CRETY (52): alimentary canal; FRENZEL (88) p. 87: parasitic Gregarines; MINCHIN (189) p. 291: with *Ctenodrilus* as inquiline; MONTICELLI (193) p. 250. *H. vagabunda*, Semper, Barrier Reef, Queensland; KENT (133) p. 5: characters of living animal; KENT (135) p. 237: STUDER (256) p. 234. *H. verrilli*, Theel, 1300 metres, Azores, fully described and figured; MARENZELLER (164) p. 7. *H. vitiensis*, characters of living animal; KENT (135) pp. 238 & 239.

H. boutani, Red Sea, HEROUARD, Arch. Zool. exp. (3) i, p. 132; *H. calcarea* [syn. of *H. fusco-cinerea*] and *H. hystrix* [syn. of *Stichopus variegatus*], Barrier Reef, Queensland, KENT (133) p. 5; *H. lentiginosa*, Pico-Fayal, Azores, 130 metres, MARENZELLER (164) p. 6, also (163) p. 64; *H. leopardus* [syn. of *H. argus*], KENT (133) pl. i, fig. 2; *H. mammifera* [same as *Actinopyga mamillata*, q.v.], KENT (133) p. 4, and (135) pp. 236 & 240; *H. marmorata*, Barrier Reef, Queensland, KENT (135) p. 237; *H. polymorpha*, ditto, KENT (133) p. 5; *H. rugosa* [syn. of *Actinopyga obesa*], ditto, *loc. cit.*; *H. sanguinolenta*, ditto, KENT (135) pp. 56 & 237: n. spp.

Kolga ludwigi, between Cerigo and Candia, and S. of C. Malea, 755–1292 metres, MARENZELLER, SB. Ak. Wien, cii, Abth. 1, p. 68, and in STEINDACHNER (254) p. 446, n. sp.

Laetmogone theeli, E. Pacific, LUDWIG, Zool. Anz. xvi, p. 180, n. sp.

Laetmophasma, n. g. of *Elasipod*, with type *L. fecundum*, n. sp., E. Pacific; LUDWIG, Zool. Anz. xvi, p. 181.

Lophothuria; AGASSIZ (3) p. 80.

Meseres, n. g. of *Aspidochirote*, with type *M. macdonaldi*, nomen nudum; LUDWIG, Zool. Anz. xvi, p. 179.

Mesites, n. g. of *Aspidochirote*, with type *M. multipes*, nomen nudum; *loc. cit.* [The name *Mesites* is preoccupied for a Cystid by Hoffmann, 1866, as well as in various other branches of Zoology.]

Molpadia turgida, Verrill; GANONG (91) p. 58.

Mulleria agassizi; FIELD (82) p. 83.

Ocnus brunneus; GARSTANG (92) p. 335.

Oneirophanta affinis, nomen nudum; LUDWIG (156) p. 180.

Orphnurgus; AGASSIZ (3) p. 84.

Pœlopatides agassizi, Theel, referred to *P. confundens*; LUDWIG (156) p. 178. *P. suspecta*, nomen nudum; *loc. cit.*

Pannychia moseleyi, Theel, n. var. *henrici*, name only; *op. cit.* p. 180.

Pelagothuria, n. g., with type *P. natatrix*, n. sp., E. Pacific, free-swimming and pelagic; LUDWIG, Zool. Anz. xvi, p. 183.

Pelagothuridæ, n. fam.; *op. cit.* p. 182.

Peniagone; AGASSIZ (3) pp. 77 & 84. *P. intermedia*, nomen nudum; *P. vitrea*, Theel, *setosa*, n. var., E. Pacific; LUDWIG (156) p. 181.

P. azorica, between Pico and São Jorge, Azores, 2870 metres, MARENZELLER, Bull. Soc. zool. France, xvii, p. 64, and (164) p. 12, n. sp.

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Pentacta has priority over *Colochirus*, not over *Cucumaria*; MARENZELLER (164) p. 14.

Phyllophorus, Ludw.; BELL (16) p. 46. *P. aculeatus*, nomen nudum; LUDWIG (156) p. 183. *P. drummondi*, Thomps.; BELL (16) p. 47. *P. frauenfeldi*, Ludwig; HEROUARD (121) p. 136. *P. pellucidus*, Düb. & Kor.; BELL (16) p. 46.

Pseudocucumis acicula, fusion of two individuals; LUDWIG (155).

Pseudostichopus, Theel, rediagnosed, and *P. mollis*, Theel, 1823 fathoms, E. Pacific; LUDWIG (156) p. 178.

P. occultatus, n. sp., Benghazi, Cerigo, Candia, W. of Milo, near Anti-Milos, 415–1503 metres, also C. Finisterre; MARENZELLER, SB. Ak. Wien, cii, Abth. 1, p. 68: W. of C. Finisterre, about 400 metres, figured; MARENZELLER (164) p. 10.

Psolidium, rediagnosed, with *P. gracile* and *P. panamense*, nomina nuda; LUDWIG (156) p. 184.

Psolinus brevis, Forbes, referred to *Cucumaria montagui*; MARENZELLER (167).

Psolus, Oken; BELL (16) p. 44. *P. antarcticus*, Phil.; STUDER (256) p. 283. *P. brasiliensis*, Theel., referred to *Psolidium*; LUDWIG, Zool. Anz. xvi, p. 184. *P. diomedeæ*, nomen nudum, *loc. cit.* *P. ephippiger*, Wyv.-Thoms., distribution; STUDER (256) p. 163. *P. fabricii*, Düb. & Kor.; BELL (16) p. 45. *P. incertus*, Theel, distribution; STUDER (256) p. 163. *P. phantapus*, Strussenf.; BELL (16) p. 44, PETERSEN (216) p. 38. *P. poriferus*, Stud., distribution; STUDER (256) p. 163. *P. squamatus*, Kor.; NORDGAARD (201) pp. 5 & 10.

P. digitatus, p. 184, *P. pauper*, p. 183, E. Pacific, LUDWIG, Zool. Anz. xvi, n. spp.

Psychropotes; AGASSIZ (3) p. 84.

P. dubiosa, *P. raripes*, E. Pacific, LUDWIG, Zool. Anz. xvi, p. 179, n. spp.

Rhopalodina lageniformis, Gray, mud of Congo mouth, translucent; STUDER (256) pp. 21 & 30.

Scotoanassa gracilis, E. Pacific, LUDWIG, Zool. Anz. xvi, p. 182, n. sp.

Scotodeima, n. g. of *Elasipod*, with type *S. setigerum*, nomen nudum; LUDWIG, Zool. Anz. xvi, p. 181.

Semperia drummondi, Herouard, see *Cucumaria montagui*. *S. dubiosa*, Semp.; STUDER (256) p. 288. *S. parva*, Ludw., distribution; STUDER (256) p. 140 & 163.

Sphærothuria, n. g. of *Dendrochirote*, with type *S. bitentaculata*, nomen nudum; LUDWIG (156) p. 184.

Stichopus chloronotus, characters of living animal, and commensal worm; KENT (135) pp. 235 & 240. *S. natans*, M. Sars (?); BELL (16) p. 51. *S. regalis*, Cuv., spermatogenesis; FIELD (83): off coast of Spain, 134 to 248 metres; MARENZELLER (164) p. 9, and STEINDACHNER (254) p. 446. *S. selenkæ*, Barrois, see *Holothuria forskahli*. *S. tizardi*, Theel; BELL (16) p. 51. *S. variegatus*, Lamp.; STUDER (256) pp. 234, 248, & 256: characters of living animal; KENT (135) pp. 57, 226, & 234.

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S. lutea, Great Barrier Reef, KENT (135) p. 235, n. sp.

Synallactes, n. g. of *Aspidochirote*, with type *S. aenigma*, nomen nudum, and *S. alexandri*, nomen nudum; LUDWIG, Zool. Anz. xvi, p. 178.

Synallactinæ, n. subfam., for *Synallactes*, *Pseudostichopus*, *Paelopatides*, *Mesites* (Ludw.), and *Meseres*; *op. cit.* p. 179.

Synapta, Esch.; BELL (16) p. 32. *S. abyssicola*, Theel, *pacifica*, n. var., E. Pacific; LUDWIG (156) p. 186. *S. besseli*, Jaeg., characters of living animal; KENT (135) p. 241: changing of shape; STUDER (256) pp. 234, 240, & 256. *S. buski*, McIntosh, BELL (16) p. 34. *S. digitata*, Mont.; *loc. cit.*, STEINDACHNER (254) p. 446, STUDER (256) p. 30: parasitic Gregarine and Copepod; CUÉNOT (60): alimentary canal; FRENZEL (88) p. 85: off coast of Spain, 248 metres, variation in spicules figured; MARENZELLER (164) p. 17: with Nematode and *Ctenodrilus* as inquilines; MONTICELLI (193) pp. 248–250. *S. inhaerens*, O. F. Müll.; BELL (16) p. 33, PETERSEN (216) p. 38, STUDER (256) p. 30: ovum described; CRETY (52): parasitic Gregarines, Ciliate Infusorian, Trematode, Rotifer, Tardigrade, and Copepod; CUÉNOT (60): oögenesis; CUÉNOT (57): with Nematode and *Ctenodrilus* as inquilines; MONTICELLI (193) pp. 248–250. *S. kefersteini*, Sel., parasitic Copepod; VOIGT (267). *S. reciproquans*, Forskal, redescribed; HEROUARD (121) p. 137. *S. reticulata*, Semp., on stem of Gorgonids; STUDER (256) p. 192. *S.* sp., habitat mangrove roots, coral slabs, sand; FIELD (82) p. 83.

Thyone, Semper; BELL (16) p. 41. *T. castanea*, Lamp.; STUDER (256) p. 192; *T. elegans*, Norm., *T. flexus*, Hodge; BELL (16) p. 43. *T. fusus*, O. F. Müll.; BELL (16) p. 42. *T. inermis*, Hell., Azores, 130–180 metres, includes *T. aurantiaca*, Costa, and *T. elegans*, Norm.; MARENZELLER (164) p. 17. *T. mirabilis*, Ludw.; STUDER (256) p. 192. *T. muricata*, Stud., distribution; *op. cit.* p. 163. *T. portlocki*, Forbes, see *Cucumaria montagui*. *T. raphanus*, Düb. & Kor.; BELL (16) p. 42. *T. recurvata*, Theel, distribution, p. 163, *T. sacellus*, Selenka, p. 192, *T. theeli*, Lamp., p. 192; STUDER (256).

Thyonidium commune, Forbes; PETERSEN (216) p. 39. *T. hyalinum*, Forbes; PETERSEN (216) p. 38.

Trochostoma; AGASSIZ (3) pp. 79, 80, & 83. *T. granulatum* and *T. intermedium*, nomina nuda; LUDWIG (156) p. 185. *T. violaceum*, Stud., distribution; STUDER (256) p. 163.

(C.)—ECHINOIDEA.

†*Acrocidaris nobilis*, Agass.; AGUILERA (4) p. 18, GREPPIN (104) p. 99.

Acrocladia mammillata, Lam., *A. trigonaria*, Klein; STUDER (256) p. 248.

†*Acrosalenia*:—*A. banburiensis*, Wright, *A. minuta*, Buckm., *A. parva*, Wright; WOODWARD (276) p. 369. *A.* sp.; FOX-STRANGWAYS (87) II, p. 144.

Aërope; AGASSIZ (3) p. 81.

Amblypneustes grossularia, Stud.; STUDER (256) p. 267.

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†*Amblypygus lorioli*, Pianosa, SIMONELLI (245) p. 222, n. sp.

Ananchites, the proper spelling of *Ananchytes*; LAMBERT (146) p. 94.

†*Ananchytes sulcatus* ?, Goldf.; AGUILERA (4) p. 27.

†*A. ovalis*, Middle Marl bed, Upper Cretaceous, Vincentown, N. J., CLARK, Bull. U. S. Geol. Surv. No. 97, p. 74, n. sp.

†*Anthobrissus cerceleti*, Pomel, see *Phyllobrissus cerceleti*.

†*Arachniopleurus*, Duncan, defined, p. 598; *A. arenatus*, d'Arch., sp., redescribed, with young stage, p. 599; *A. reticulatus*, Dunc. & Slad., p. 602; *A. vilanovæ*, Cott., sp., p. 603: COTTEAU (44).

Arachnoides placenta, Linn.; LORIOL (154) p. 376, STUDER (256) p. 181.

Arbacia alternans, Trosch., ova in ambulacra, p. 281; *A. dufresni*, Blainv., colour; STUDER (256) p. 289. *A. nigra*, Mol. sp., Callao, with variations in anal plates; MEISSNER (181) p. 184. *A. punctulata*, Desm., multiple genital and madreporic pores; JANET (128): experiments on eggs; MORGAN (196): also STUDER (256) p. 22. *A. pustulosa*, Gray; STUDER (256) p. 22: spermatogenesis; FIELD (83). *A. spathuligera*, Val. sp., Callao, with variations in anal plates; MEISSNER (181) p. 184.

Arbaciadæ, apical system; AGASSIZ (2) p. 77.

†*Archæocidaris*, sp., Gympie Beds, Queensland; ETHERIDGE (76) p. 213.

Aspidodiadema; AGASSIZ (3) pp. 77 & 80.

Asthenosoma, Grube; BELL (16) p. 143, AGASSIZ (3) pp. 80 & 83. *A. hystrix*, W. Thoms.; BELL (16) p. 143. *A. varium*, Grube, detailed description of two perfect specimens, and of a young also (?) of this species; LORIOL (154) p. 364.

Astriclypeus manni, Verrill sp.; MEISSNER (181) p. 185.

Astropyga elastica, Stud.; STUDER (256) pp. 248 & 256.

†*Australanthus*, n. g., type *Cassidulus longianus*, Greg.; BITTNER, SB. Ak. Wien, ci, Abth. i, p. 350.

†*Baueria*, Noetl., defined and discussed, p. 573; *B. geometrica*, Noetl., p. 577; *B. rousseli*, Cott. sp., redescribed, p. 574: COTTEAU (44).

†*Bothriocidaris*, apical system; AGASSIZ (2) p. 72.

†*Botriopygus alabamensis*, Clark, redescribed and now first figured; CLARK (36) p. 60. *B. nanclasi*, Senonian of Angoulême; ARNAUD (9) p. 27.

Breynia, Desor, defined; COTTEAU (44) p. 670. *B. australasiæ*, Leach; STUDER (256) pp. 192 & 194. †*B. meslei*, ascribed to Gauthier, 1893, perhaps n. sp., Eocene, Djebel-Trozza, Tunis; COTTEAU, Pal. Franc. Ech. Tert. ii, p. 671.

Brissopsis, Agass.; BELL (16) p. 172, AGASSIZ (3) p. 281. *B. lyrifera*, Forbes; BELL (16) p. 172, DANIELSSEN (62) p. 5, PETERSEN (216) p. 42: great numbers on W. Coast of Scotland; SCOTT (238) p. 50. †*B. sismondæ*, Agass., Helvetian of Rassuen, Rhone Basin; DEPÉRET (64) p. 448.

B. oldhami, B. of Bengal, 753 fathoms; ALCOCK, J. Asiat. Soc. Bengal, lxii, p. 174, n. sp.

†*Brissospatangus vicentinus* [Eocene ?], of Vicentino, Italy; MAZZETTI, Atti Soc. Modena (3) x, n. sp.

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Brissus maculatus, Klein ; STUDER (256) p. 235. *B. unicolor*, Klein ; STUDER (256) p. 22, SIMONELLI (245) p. 221.

†*Calymne*, Wyv.-Thoms. ; LAMBERT (146) p. 98.

†*Cardiaster*, Forbes, discussed ; LAMBERT (146) p. 96. *C. cinctus*, Morton sp., redescribed ; CLARK (36) p. 75. *C. cotteanus*, Cretaceous, Silesia ; LANGENHAN & GRUNDEY (147) p. 8. *C. granulosus*, Forbes ; PARENT (207) p. 317 : Senonian of Angoulême ; ARNAUD (9) p. 29. *C. latissimus*, see *Holaster*. *C. marticensis*, Cott., referred to *Hemipneustes* ; COTTEAU (38) p. 9 : discussed ; LAMBERT (146) p. 95. *C. tenuiporus*, Cott. & Trig., referred to *Hemipneustes* ; COTTEAU (38) p. 10. *C. tertiarius*, Greg. ; BITTNER (21) p. 360 : referred to *Holaster* ; LAMBERT (146) p. 94. *C. transversus*, Cott., Senonian of Angoulême ; ARNAUD (9) p. 25. *C. zignoi*, d'Orb., referred to *Ovulaster* ; LAMBERT (146) p. 97.

†*Cassidulus* :—*C. abruptus*, Conrad, p. 92 ; *C. æquoreus*, Morton, redescribed, p. 68 ; *C. florealis*, Morton sp., redescribed, p. 66 : CLARK (36).—*C. longianus*, Greg., type of new genus, *Australanthus*; BITTNER (21) p. 350. *C. micrococcus*, Gabb, redescribed and now first figured, p. 69; *C. porrectus*, Clark, ditto, and locality corrected from Mississippi to Ripley group of Eufaula, Alabama, p. 72 ; *C. stantoni*, Clark, redescribed and now first figured, p. 73 ; *C. subconicus*, ditto, p. 71 ; *C. subquadratus*, Conrad, redescribed, p. 70 ; CLARK (36).

†*Catopygus*, *cf. cylindricus*, Desor ; LAMBERT in PARENT (209) p. 218. †*C. elegans*, Laube, type of new genus *Tristomanthus* ; BITTNER (21) p. 355. *C. loveni*, Stud. ; STUDER (256) p. 55. †*C. oviformis*, Conrad, redescribed ; CLARK (36) p. 64. †*C. pusillus*, Clark, ditto and now first figured ; *op. cit.* p. 65. †*C. tenuiporus*, L. Agass., discussed ; LAMBERT (146) p. 71.

†*Cibaster*, Pomel, discussed ; LAMBERT (146) p. 96.

Cidaridæ, apical system ; AGASSIZ (2) p. 74.

Cidaris, Leske ; AGASSIZ (3) p. 80, BELL (16) p. 139 : defined and discussed ; COTTEAU (44) p. 395. †*C. abichi*, Moesch : SIEMIRADZKI (244) p. 143. †*C. acanthica*, Fritsch ; COTTEAU (44) p. 449. †*C. acicularis*, d'Arch., redescribed ; COTTEAU (44) p. 434. †*C. alata*, Agass. ; OGILVIE (205) p. 50 : Boll, *non* Münst., perhaps = *C. hagenowi*, Desor ; SCHLUETER (236) p. 14. †*C. alpina*, Cott. ; MOESCH (192) p. 7. †*C. amalthei*, Quenst. ; FOX-STRANGWAYS (87) II, p. 32, WOODWARD (276) p. 369. †*C. attenuata*, Cott., redescribed ; COTTEAU (44) p. 414. †*C. avenionensis*, DesM. ; SIMONELLI (245) p. 233, DEPÉRET (64) p. 448, TOULA (265) p. 291. †*C. belone*, Agass., redescribed ; COTTEAU (44) p. 421. †*C. bietzi*, Koch ; *op. cit.* p. 446. †*C. biformis*, Münst. ; OGILVIE (205) p. 51. †*C. blumenbachi*, Münst. ; GREPPIN (104) p. 99, SMITH (250) p. 346. †*C. braunii*, Desor ; OGILVIE (205) p. 50. †*C. buchi*, Münst. ; *op. cit.* p. 51. †*C. cervicornis*, Schaur. ; COTTEAU (44) p. 443. †*C. clavigera*, König ; CAYEUX (28) p. 118. †*C. coronata*, Schloth. ; GREPPIN (104) p. 99, SIEMIRADZKI (244) p. 142. †*C. crateriformis*,

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Gümbel, redescribed, includes *C. raulini*; Cotteau (44) p. 408. †*C. cretosa*, Mant., referred to *Stereocidaris sceptrifera*; Schlueter (236) p. 110. †*C. decorata*, Münst.; Ogilvie (205) p. 50. †*C. dixoni*, Cott., referred to *Tylocidaris strombecki*; Schlueter (236) p. 43. †*C., cf. domeriensis*, Menegh., Lower Lias, Calabria; Greco (100) p. 79. †*C. dorsata*, Braun; Ogilvie (205) p. 50. †*C. dumortieri*, Wright; Woodward (276) p. 369. †*C. edwardsi*, Wright; *loc. cit.* and Fox-Strangways (87) II, p. 32. †*C. excelsa*, Dunc. & Slad.; Cotteau (44) p. 450. †*C. farringdonensis*, Wright, see under *Goniocidaris*. †*C. fasciculata*, Klipst.; Ogilvie (205) p. 50. †*C. filograna*, Agass.; Moesch (192) p. 27, Siemiradzki (244) p. 143. †*C. flexuosa*, Münst.; Ogilvie (205) p. 50. †*C. florigemma*, Phill.; Greppin (104) p. 99, Fox-Strangways (87) II, p. 193, Siemiradzki (244) p. 142, Smith (250) p. 346. †*C. gaultina* Forbes; Lambert in Parent (209) pp. 218 & 222. †*C. gehrdenensis*, new name doubtfully proposed for spines doubtfully referred to *Dorocidaris pseudopistillum*; Schlueter (236) p. 80. †*C. gervasiana*, Sorignet; Cotteau (44) p. 440. †*C. glandaria*, Fraas; Cotteau (47, 48). †*C. gourdoni*, Cott., see *C. pomeli*. †*C. gracilis*, Slad.; Bell (16) p. 142. †*C. halaensis*, d'Arch.; Cotteau (44) p. 448. †*C. hausmanni*, Wissm.; Ogilvie (205) p. 50. †*C. hirsuta*, Marcou, discussed and figured; Schlueter (236) p. 7. †*C. hirudo*, Sorign.; Cayeux (28) p. 118. †*C. hollandei*, Cott.; Simonelli (245) p. 232. †*C. hungarica*, Pavay, redescribed; Cotteau (44) p. 443. †*C. ilminsterensis*, Wright; Woodward (276) p. 369. †*C. infratertiarius*, Quenst.; Cotteau (44) p. 444. †*C. interlineata*, d'Arch., redescribed; *op. cit.* p. 428. †*C., cf. itys*, d'Orb.; Stuber (255) p. 79. †*C. janus*, Fritsch; Cotteau (44) p. 448. †*C. jouannetti*, DesM., Senonian of Angoulême; Arnaud (9) p. 25. †*C. klipsteini*, Desor; Ogilvie (205) p. 50. †*C. lacrymula*, Dunc. & Slad.; Cotteau (44) p. 449. †*C. liagora*, Münst., †*C. linearis*, Münst.; Ogilvie (205) p. 50. †*C. longicollis*, Fritsch; Cotteau (44) p. 448. †*C. lorioli*, Cott., redescribed; *op. cit.* p. 415. †*C. loveni*, Cott., referred to *Rhabdocidaris*; *op. cit.* p. 462. *C. lutkeni*, Lor., see *Rhabdocidaris annulifera*. †*C., cf. mamillata*, Cott., figured; Schlueter (236) p. 141. †*C. martini*, Cott.; Stuber (255) p. 79. †*C. mayeri*, Lor., redescribed; Cotteau (44) p. 442. †*C. membranipora*, Stud. sp., sexual dimorphism, protection of ova, distribution; Studer (256) pp. 143, 149, & 163. †*C. mespilum*, Desor sp., redescribed; Cotteau (44) p. 441. *C. metularia*, Lam.; Loriol (154) p. 360. †*C. mezzoana*, Laube, referred to *Rhabdocidaris*; Cotteau (44) p. 461. †*C. mortoni*, Conrad; *op. cit.* p. 448. †*C. munsteri*, Sis.; Simonelli (245) p. 233. †*C. muricata*, F. A. Roem., discussed and distinguished from *C. hirsuta*, figured; Schlueter (236) p. 9. †*C. nahalakensis*, Lor.; Clark (36) p. 93. †*C. navillei*, Cott., referred to *Rhabdocidaris*; Cotteau (44) p. 464. †*C. nummulitica*, Sism.; *op. cit.* p. 400. †*C. oosteri*, Laube, redescribed; *op. cit.* p. 417. †*C. opipara*, Dunc. & Slad.; *op. cit.* p. 450.

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C. papillata, Leske ; BELL (16) p. 139 : spine only ; TOMMASI (262) p. 1115. †*C. parastadifera*, Schafh.; OGILVIE (205) p. 51. †*C. perornata*, Forbes, double genital pores ; JANET (128). †*C. polyacantha*, Reuss. ; TOULA (265) p. 291. †*C. pomeli*, Cott., redescribed, includes *C. gourdoni* ; COTTEAU (44) p. 404. †*C. poresesdiensis*, Koch. ; *op. cit.* p. 445. †*C. prionata*, Agass., redescribed ; *op. cit.* p. 436. †*C. propinqua*, Goldf.; SIEMIRADZKI (244) p. 142. †*C. pseudoserrata*, Cott.; TOULA (265) p. 291. †*C. punctata*, F. A. Roem., described and figured; SCHLUETER (236) p. 10. *C. purpurata*, W. Thoms. ; BELL (16) p. 141. †*C. pyrenaica*, Cott., redescribed ; COTTEAU (39) p. 542. †*C. raulini* Cott., see *C. crateriformis*. †*C. reussi*, Geinitz ; MICHAEL (184) p. 240. †*C. rimatus*, Quenst., erroneously quoted as *C. rimosus*, and referred to *Temnocidaris danica*; SCHLUETER (236) p. 125. †*C. roemeri*, Wissm.; OGILVIE (205) p. 50. †*C. sabaratensis*, Cott., redescribed; COTTEAU (44) p. 398. †*C., cf. salevensis*, Desor ; LAMBERT in PARENT (209) p. 225. *C. savignyi*, Aud. sp., habits of life and sense organs ; BOUTAN (24) p. 212, pl. vii. †*C. scampicei*, Taramelli ; COTTEAU (44) p. 444. †*C. sceptrifera*, Mant. ; CAYEUX (28) p. 119 : figured, FRIČ (98) p. 109 : double genital pores ; JANET (128). †*C. scrobiculata*, Braun; OGILVIE (205) p. 51. †*C. semiaspera*, d'Arch., see *C. subularis*. †*C. semicosta*, Münst.; OGILVIE (205) p. 50. †*C. seminota*, Sorignet ; COTTEAU (44) p. 439. †*C. smithi*, Wright ; FOX-STRANGWAYS (87) II, p. 194. †*C.* sp. ; GREGORY (102) p. 3. †*C.* sp., Lias, Kurremölla in Scania, spines only ; MOBERG (190) pp. 26 & 27. †*C. spileccensis*, Dames; COTTEAU (44) p. 444. †*C. spinigera*, Dames, redescribed ; *op. cit.* p. 419. †*C. spinosa*, Boll., discussed, and distinguished from *C. spinosissima*, Agass. ; SCHLUETER (236) p. 15 : also OGILVIE (205) p. 50. †*C. splendens*, Morton, detached plates redescribed; CLARK (36) p. 33. †*C. striata*, Hutton ; COTTEAU (44) p. 447. †*C. striatogranosa*, d'Arch., redescribed; COTTEAU (44) p. 432. †*C. striatula*, Marck, spines described ; SCHLUETER (236) p. 13. †*C. subcylindrica*, d'Arch., redescribed ; COTTEAU (44) p. 430. †*C. submarginata*, Félix ; AGUILERA (4) p. 18. †*C. subnobilis*, Münst. ; OGILVIE (205) p. 51. †*C. subprionata*, Rouault, redescribed ; COTTEAU (44) p. 438. †*C. subserrata*, d'Arch., redescribed; *op. cit.* p. 426. †*C. subsimilis*, Münst. ; OGILVIE (205) p. 50. †*C. subularis*, d'Arch., redescribed, includes *C. semiaspera* ; COTTEAU (44) p. 422 : var. ; TOULA (265) p. 288. †*C. subvesiculosa*, d'Orb., Senonian of Angoulême ; ARNAUD (9) p. 29: also FRIČ (89) p. 109. †*C.* sp., *cf. subvesiculosa*, Goldf. ; MICHAEL (184) p. 243. †*C. taramellii*, Cott., redescribed ; COTTEAU (44) p. 412. †*C. tessurata*, Menegh. ; SIMONELLI (245) p. 228. *C. thouarsi*, Val., boring holes ; FEWKES (80). †*C. tribuloides*, Lam., Pliocene of E. Pyrenees, spines only ; †COTTEAU (42) p. 736 : also FIELD (82) p. 83, STUDER (256) pp. 22 & 48. †*C. trigona*, Münst., †*C. triserrata*, Laube ; OGILVIE (205) p. 50. †*C. verneuilli*, d'Arch. ; COTTEAU (44) p. 447. †*C. veronensis*, Quenst. ; *op. cit.* p. 445. †*C. vesiculosa*, Goldf. ; MICHAEL

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(184) p. 240, PARENT (209) p. 229. †*C. vilanovæ*, Cott.; COTTEAU (44) p. 446. †*C. vincenti*, Cott.; *op. cit.* p. 445. †*C. walcotti*, Clark, redescribed and now first figured; CLARK (36) p. 37.

†*C.* (*Pseudocidaris*) *baltica*, Upper Senonian, Seeland and Rügen, founded on spines, SCHLUETER, Abh. Preuss. geol. Landesanst. Heft 5, p. 16. †*C. bausseteusis*, Upper Hippurite Chalk, near Bausset, Var; COTTEAU, Mem. Soc. zool. France, iii, p. 545; †*C. californicus*, Jurassic, Taylorsville, California, founded on spines only, CLARK, Bull. U. S. Geol. Surv. No. 97, p. 36; *C. curvatispinis*, Mauritius, BELL (19) Tr. Zool. Soc. London, xiii, p. 303; †*C. feliciæ*, Upper Eocene of Biarritz, spine only, COTTEAU, Mem. Soc. zool. France, v, p. 735; †*C.*, n. sp., aff. *filograna*, Dogger, Erzplatz, Switzerland; MOESCH (192) p. 28. †*C. gigas*, n. sp. (?), name doubtfully given to some plates from Maestrichtian in Museum für Naturkunde, Berlin; SCHLUETER, Abh. Preuss. geol. Landesanst, Heft 5, p. 142. †*C. grossouvrei*, Montlaur, Ariège, COTTEAU, Pal. franc., Ech. Tert. ii, p. 402; †*C. hautevillensis*, Middle Eocene, Hauteville, Manche, *op. cit.* p. 410; †*C. lariana*, based on *C. verticillata*, Stopp., *non* Lam., Rhaetic, Poggio Piana, Italy, spines only, SIMONELLI, Mem. Acc. Bologna (5) ii, p. 243; †*C. matronensis* [ascribed to de Loriol, but apparently n. sp.], Middle Eocene, Damery, near Épernay, COTTEAU, Pal. franc., Ech. Tert. ii, p. 440. †*C. plexa*, Aptien, Grandpré, LAMBERT, Bull. Soc. géol. (3) xx, p. 38; †*C. rejaudryi* [ascribed to Arnaud, but apparently n. sp.], geological horizon not stated, Atlas Bocage in Charente-Inférieure, spine only, COTTEAU, Mem. Soc. zool. France, v, p. 734; †*C. royanensis*, n. sp., name without diagnosis for specimens figured by Cotteau, Pal. franc., Terr. Crét. tab. 1057, SCHLUETER, Abh. Preuss. geol. Landesanst. Heft 5, p. 110; †*C.* n. sp., plates only, Neocomian, N. Germany, SCHLUETER, Abh. Preuss. geol. Landesanst. Heft 5, p. 12; †*C. taylorensis*, Jurassic, Taylorsville, California [the name should therefore be *C. taylorsvillensis*], p. 35, †*texanus*, Washita, formation of the Comanche series, Lower Cretaceous, Bexar co., Texas, p. 36, CLARK, Bull. U.S. Geol. Surv. No. 97 : n. spp.

†*Circopeltis*, Pomel, defined and discussed; COTTEAU (44) p. 508: redescribed; COTTEAU (39) p. 537.

C. baicherei, Middle Eocene, Montazels and Conques, in Aude, with young stages, p. 510, *C. bouillei*, Eocene, near Biarritz, founded on *Cyphosoma pellati*, Bouillé, p. 513, *C. garginense*, Upper Eocene, near Biarritz, p. 515, COTTEAU, Pal. franc., Ech. Tert. ii; *C. peroni*, Senonian, Le Castelet, Var; COTTEAU, Mem. Soc. zool. France, iii, p. 537 : n. spp.

Clypeaster; AGASSIZ (3) p. 80. †*C. aegyptiacus*, Wright; SIMONELLI (245) p. 223. †*C. altus*, Lam.; COTTER (49) p. 235, and (50) p. 259, SIMONELLI (245) p. 224. †*C. crustulum*, Mich.; AGUILERA (4) p. 43. †*C. gibbosus*, Serres; SIMONELLI (245) p. 226. †*C. gippslandicus*, M'Coy; BITTNER (21) p. 347. †*C. humilis*, Agass.;

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MAZZETTI (177). †*C. intermedius*, Desm., Helvetian of Rhone basin; DEPÉRET (64) p. 436. †*C. meridanensis*, Mich.; AGUILERA (4) p. 43. †*C. partschii*, Mich.; ZHIVKOVICH (278) p. 99. *C. scutiformis*, Gm.; STUDER (256) pp. 216 & 235. *C. subdepressus*, Agass.; STUDER (256) p. 22, FIELD (82) p. 84.

†*C. paretoi*, SIMONELLI (245) p. 226, n. sp.

†*Clypeolampas ovum*, Senonian of Angoulême; ARNAUD (9) p. 28.

†*Clypeus*:—*C. michelini*, Wright sp.; FOX-STRANGWAYS (87) II, p. 144. *C. sinuatus*, in Discoideen-mergel near Basle; GREPPIN (103). *C. subulatus*, Young & Bird, sp.; FOX-STRANGWAYS (87) II, p. 194.

†*Codiopsis doma*, Desor; FICHEUR (81) p. 412.

†*Coelopleurus*, Agass., defined and discussed, p. 544; *C. agassizi*, d'Arch., redescribed, p. 564; *C. coronalis*, Leske ex Klein, redescribed, p. 550; *C. delbosi*, Desor, redescribed, p. 552; *C. infulatus*, Morton sp., p. 571; *C. paucituberculatus*, Greg.; *C. radiatus*, Agass., redescribed, p. 546, COTTEAU (44). *C. rousseli*, Cott., see *Baueria*. *C. tournoueri*, Cott., redescribed, with variations, and now first figured, p. 556; *C. wetherelli*, Forbes, p. 571; *C. zaddachi*, Noetl., p. 572; COTTEAU (44).

C. douvillei, Middle Eocene of Eure and Manche, COTTEAU, Pal. franc., Ech. Tert. ii, p. 549; *C. isabellæ*, geological horizon not stated, Gurp in Barcelona, COTTEAU, Mem. Soc. zool. France, v, p. 741, distinguished from *C. coronalis*, COTTEAU (45); *C. munieri*, Upper Eocene, La Gourèpe, Basses-Pyrénées, COTTEAU, Pal. franc., Ech. Tert. ii, p. 568 : n. spp.

†*Collyrites*:—*C.* ? sp.; RETOWSKI (221) p. 288. *C. bicordata*, Leske, sp.; FOX-STRANGWAYS (87) II, p. 194. *C., cf. bicordata*, Leske; GREGORY (102) p. 9. *C. carinata*, Desm.; FICHEUR (81) p. 401. *C. dorsalis*, Agass. & Desor.; GREGORY (102) p. 8. *C. thermarum*, Moesch; SIEMIRADZKI (244) p. 144.

†*Coptechinus*:— *C. lineatus*, n. sp., but probably same as *Orthologhus lineatus*, Duncan, Tertiary, Australia; BITTNER, SB. Ak. Wien, ci, Abth. 1, p. 338. *C. pulchellus*, Tertiary, Australia, *op. cit.* p. 342: both species are referred to *Paradoxechinus novus*, TATE (257) p. 191: n. spp.

†*Coptosoma*, Desor, defined and discussed, p. 486; *C. archiaci*, Sism., p. 501; *C. atacicum*, Cott., redescribed, p. 490; *C. blanggianum*, Desor sp., p. 502; *C. cribrum*, Agass. sp., redescribed, p. 487; *C. haimei*, Desor, p. 503; *C. macrostoma*, Dunc. & Slad. sp., p. 504, COTTEAU (44). *C. mortoni*, Lor. sp.; CLARK (36) p. 51. *C. pellati*, Cott. sp., redescribed, with young stages; COTTEAU (44) p. 492. *C. samperi*, Cott. sp.; *op. cit.* p. 504. *C. speciosum*, Clark, redescribed and now first figured; CLARK (36) p. 52. *C. tertiarium*, Lehon sp.; COTTEAU (44) p. 503. *C. undatum*, Dunc. & Slad. sp.; *op. cit.* p. 505. *C. monzense*, p. 499, and *C. pentagonale*, p. 498, Middle Eocene, Monze, Montagne d'Alaric, Aude, *C. rousseli*, Middle Eocene, Saint-Martin, Montagne-Noire, Aude, p. 495; COTTEAU, Pal. franc., Ech. Tert. ii: n. spp.

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†*Corculum*, Pomel, discussed; LAMBERT (146) p. 97.

†*Cyclaster lycoperdon*, Tertiary, Australia, BITTNER, SB. Ak. Wien, ci, Abth. 1, p. 360; it is syn. of *C. archeri*, Ten.-Woods, TATE (257) p. 193 : n. sp.

†*Cyphosoma* :—*C. ameliæ*, Cott., p. 25, *C. arnaudi*, Cott., p. 29, Senonian of Angoulême; ARNAUD (9). *C. atacicum*, Cott., see *Gagaria*. *C. aquitanicum*, Cott.; AGUILERA (4) p. 26. *C. blanggianum*, Desor sp., see *Coptosoma*. *C. cotteaui*, p. 28, *C. desmoulinsi*, p. 29, Senonian of Angoulême; ARNAUD (9). *C. engolismense*, Arnaud, apical system described and compared with that of other *Cyphosomata* and of *Gauthieria*; COTTEAU (42) p. 731 : from Turonian of Angoulême compared with *C. archiaci*, Cott.; ARNAUD (9) p. 18. *C. macrostoma*, Dunc. & Slad., see *Coptosoma*. *C. magnificum*, Senonian of Angoulême; ARNAUD (9) pp. 27 & 28. *C. noguesi*, Cott., referred to *Gagaria atacica*; COTTEAU (44) p. 525. *C. pellati*, Cott., see *Coptosoma*. *C. pellati*, Bouillé, see *Circopeltis bouillei*. *C. pulchellum*, referred to *Orthechinus*; COTTEAU (46) p. 351. *C. radiatum*, Sorignet, and *C.* sp.; PARENT (207) p. 317. *C. saemanni*, Danian of Angoulême; ARNAUD (9) p. 34. *C. tertiarium*, Lehon, see *Coptosoma*. *C. texanum*, Roem.; AGUILERA (4) p. 26. *C. undatum*, Dunc. & Slad., see *Coptosoma*. *C. verneuili*, Danian of Angoulême; ARNAUD (9) pp. 34 & 41.

C. rejaudryi [ascribed to Arnaud, but apparently] n. sp., Lower Campanian of Floirac in Charente-Inférieure; COTTEAU, Mem. Soc. zool. France, vi, p. 349.

†*Cystechinus*, A. Agass.; AGASSIZ (3) pp. 77, 79, 81, & 83, LAMBERT (146) p. 98.

†*Diadema arenatum*, d'Arch., see *Arachniopleurus*. †*D. desori*, Reuss; TOULA (265) p. 291. †"*D., cf. desori*, Reuss," Futterer, is synonym of *D. nanum*; SANDBERGER (234). *D. setosum*, Desm.; STUDER (256) pp. 22, 248, & 256, LORIOL (154) p. 363 : protection by spines; FIELD (82) p. 83 : protection afforded by spines, respiratory bladder, blue eye-spots; KENT (135) p. 42 : see also under *Cidaris savignyi*. †*D. variolare*, Agass., see *Diplopodia renevieri*.

†*Diademopsis*, *cf. globulus*, Agass., Lower Lias, Calabria; GRECO (100) p. 79.

†*Diplocidaris* :—*D. desori*, Wright; WOODWARD (276) p. 370. *D. gigantea*, Agass.; GREPPIN (104) p. 99.

†*Diplopodia* :—*D. hilli*, Clark, originally referred to *Pseudodiadema*, now redescribed and first figured; CLARK (36) p. 50. *D. texanum* [should be *texana*], Roem. sp., previously referred to *Cyphosoma* and *Pseudodiadema*, now first referred to this genus, also thought to include *Echinus bolivarii*, d'Orb., redescribed; CLARK (36) p. 48. *D. malbosi* ?, Desor; AGUILERA (4) p. 26. *D. renevieri*, Cotteau sp., described with its varieties and young, and literary history discussed; LAMBERT (145) p. 58.

†*Dipneustes*, n. g., with type *D. aturicus*, n. sp., Danian of Rivières, near Tercis (Landes); COTTEAU, C.R. Ac. Sci. cxiv, p. 891.

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†*Discoidea* :—*D. cylindrica*, Lam. sp., perignathic girdle ; DUNCAN & SLADEN (71). *D. occidentale*, Gabb ; CLARK (36) p. 93.

†*Discoides*, Klein, 1734, name maintained instead of *Discoidea*, Gray, and held to cover the unnecessary *Pithodia*, Pomel, and *Echinites*, Duncan; LAMBERT (145) p. 77.

D. peroni, Aptian, Grandpré, with varr. *D. decoratus*, Barrois, and *D. conicus*, Barrois, and variations in madreporite, LAMBERT, Bull. Soc. géol. (3) xx, p. 78, n. sp.

†*Dochmostoma*, Duncan, limited ; LAMBERT (146) p. 69.

Dorocidaris, AGASSIZ (3) p. 80. †*D. coronoglobus*, Quenst. sp., spines described and figured ; SCHLUETER (236) p. 66. †*D.*, *cf. hirudo*, Signoret, Lower Senonian, Hannover ; *op. cit.* p. 74. *D. papillata*, Leske ; DANIELSSEN (62) p. 6, STEINDACHNER (254) p. 446, †SIMONELLI (245) p. 228, †TOULA (265) p. 291: dorsal organ ; LEIPOLDT (148) p. 602 : colour ; STUDER (256) pp. 22 & 29. †*D.*, *cf. perornata*, Forbes sp., Lower Turonian of Fleischer Camp, near Salzgitter, p. 67 ; †*D. pistillum*, Quenst., spines described, p. 84 ; †*D. cf. pseudopistillum*, Cott., discussed, p. 76 ; †*D. subvesiculosa*, d'Orb. sp., discussed and considered not to occur in N. Germany, p. 67 ; †*D. vesiculosa*, Goldf. sp., described, figured, and discussed, p. 57 ; SCHLUETER (236).

†*D. essenensis*, Cenomanian, Essen, separated from *Cidaris vesiculosa*, p. 61, †*D. herthae*, Upper Senonian, Rügen, p. 81, SCHLUETER, Abh. Preuss. geol. Landesanst. Heft 5 : n. spp.

†*Dysaster siliceus*, Quenst. ; SIEMIRADZKI (244) p. 144.

†*Echinanthus ataxensis*, Cott. ; †*E. carinatus*, Cott., p. 12 ; †*E. gracilis*, Cott., redescribed from more perfect specimens, p. 13 ; †*E. heberti*, Cott., †*E. pouechi*, Cott., p. 12 ; †*E. rayssacensis*, Cott., p. 13, ROUSSEL (226). *E. rosaceus*, Gr. ; FIELD (82) p. 84. †*E. subhemisphæricus*, Ebert, referred to *Tristomanthus* ; BITTNER (21) p. 355.

Echinarachnius mirabilis, Barnes sp. ; MEISSNER (181) p. 185.

†*Echinites*, see *Discoides*.

†*Echinobrissus* :—*E. clunicularis*, Lhwyd sp. ; FOX-STRANGWAYS (87) II, p. 144: in Discoideen-mergel, near Basle ; GREPPIN (103). *E. damesi*, Struckm.; SMITH (250) p. 346. *E. dimidiatus*, Phill. sp. ; FOX-STRANGWAYS (87) II, p. 195. *E. expansus*, Clark, redescribed and now first figured ; CLARK (36) p. 61. *E. goldfussi*, Desor ; SIEMIRADZKI (244) p. 144. *E. orbicularis*, Phill. sp. ; FOX-STRANGWAYS (87) II, p. 144. *E. scutatus*, Lam. sp. ; *op. cit.* p. 195. *E. subsitifensis*, Per. Gauth. ; FICHEUR (81) p. 421. *E. texanus*, Clark, redescribed and now first figured ; CLARK (36) p. 62.

Echinocardium, Gray ; BELL (16) p. 168. *E.* (*Amphidetus*) *ovatum*, Leske ; DANIELSSEN (62) p. 5. *E. australe*, Gray sp. ; MEISSNER (181) p. 185. *E. cordatum*, Penn. ; BELL (16) p. 169, PETERSEN (216) p. 41 : parasitic Gregarine ; CUÉNOT (60). †*E. depressum*, Agass., Helvetian of Rhone Basin ; DEPÉRET (64) p. 436. †*E. dubium*, Per. & Gauth., redescribed ; COTTEAU (44) p. 665. *E.*

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flavescens, Müll. sp.; Bell (16) p. 171, Petersen (216) p. 41, Scott (240) p. 82. *E. mediterraneum*, Gray; Efisio (73) p. 253. †*E. nummuliticum*, Per. & Gauth., redescribed; Cotteau (44) p. 662. *E. pennatifidum*, Norm.; Bell (16) p. 170.

†*Echinoconus* :—*E. gigas*, Cott., p. 354, *E. raulini*, d'Orb., p. 353; Fallot (78).

E. lezennensis, Senonian (zone of *Micraster breviporus*), Lezennes, near Lille; Parent, Ann. Soc. géol. Nord. xx, p. 18, n. sp.

†*Echinocorys*, Breyn., discussed; Lambert (146) p. 97. *E. gibbus*, Agass.; Cayeux (28) p. 119, Parent (207) p. 317. *E. heberti*, Seunes, p. 353, *E. vulgaris*, Breyn., p. 354; Fallot (78).

Echinocrepis; Agassiz (3) p. 81.

Echinocyamus, Van Phels.; Bell (16) p. 160: redescribed and discussed; Cotteau, Pal. franc., Ech. Tert. ii, p. 348. †*E. affinis*, Desm. sp., redescribed, with variations and young stages; *op. cit.* p. 368. †*E. alpinus*, Agass.; *op. cit.* p. 375. †*E. altavillensis* ?, Agass.; Aguilera (4) p. 43. *E. angulosus*, Leske; Danielssen (62) p. 6. †*E. biarritzensis*, Cott.; Cotteau (44) p. 374. †*E. cambonensis*, Cott., redescribed; *op. cit.* p. 360. *E. crispus*, nomen nudum; Mazzetti (177). †*E. dacicus*, Pavay; Cotteau (44) p. 375. †*E. dumasi*, Cott., redescribed; *op. cit.* p. 357. *E. elegans*, nomen nudum; Mazzetti (177). †*E. gracilis*, Cott.; Cotteau (44) p. 377. †*E. inflatus*, Defr. sp., redescribed; *op. cit.* p. 351. †*E. lorioli*, Cott., redescribed; *op. cit.* p. 364. †*E. nummuliticus*, Dunc. & Slad.; *op. cit.* p. 377. †*E. propinquus*, Galeotti sp.; *op. cit.* p. 376. †*E. pomeli*, Cott., redescribed; *op. cit.* p. 366. *E. pusillus*, O. F. Müll.; Bell (16) p. 160, Efisio (73) p. 252, Petersen (216) p. 41, Studer (256) p. 22, †Simonelli (245) p. 228 : development; Theel (260). †*E. rotundus*, Dunc. & Slad.; Cotteau (44) p. 378. †*E. subcaudatus*, Desm. sp., redescribed, with variations; *op. cit.* p. 371. †*E. cf. subcaudatus*, Agass., rounded var., Eocene, S.W. of Strandsee of Burgas, Balkans; Toula (264) p. 450. †*E. vasseuri*, Cott., redescribed; Cotteau (44) p. 362.

†*E. cassellensis*, Middle Eocene of Cassel, Nord, p. 356, †*E. morleti*, Middle Eocene, Anvers, Seine-et-Oise, p. 354, Cotteau, Pal. franc., Ech. Tert. ii : n. spp.

Echinodiscus auritus, Leske sp.; Meissner (181) p. 185, Mazzetti (177), Loriol (154) p. 375 : Red Sea; Boutan (24) p. 352. *E. biforis*, Red Sea; Boutan (24) p. 352.

†*Echinolampus angulatus*, Mer.; Simonelli (245) p. 232. †*E. gambieriensis*, Ten.-Woods; Tate (257) p. 193. *E. hellei*, Val.; Studer (256) p. 21. †*E. hemisphaericus*, Agass.; Depéret (64) p. 448. †*E. hoffmanni*, Desor; Simonelli (245) p. 222. †*E. ovalis*, St. Vinc. sp., six-rayed with two anterior ambulacra and other modifications; Cotteau (42) p. 740. †*E., cf. posterocrassa*, Greg., Tertiary, Australia; Bittner (21) p. 356.

E. castanea, Bay of Bengal, 11 fathoms, Alcock, J. Asiat. Soc. Bengal,

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lxii, p. 173 ; †*E. dumasi*, Middle Miocene of Montigné Briand and Langeais in Maine-et-Loire, COTTEAU, Mem. Soc. zool. France, vi, p. 353 ; †*E. morgani*, Tertiary, Mt. Gambier, Australia, COTTEAU, Mem. Soc. zool. France, iii, p. 546 : n. spp.

Echinometra lucunter, Blainv. sp., habits of life ; BOUTAN (24) p. 213: borings ; STUDER (256) pp. 192, 216, 248, & 260 : Leske sp., Tahiti ; MEISSNER (181) p. 184 : Leske *non* Linn., criticising Loven's use of the name ; LORIOL (154) p. 373. *E. macrostoma*, Lütk. ; STUDER (256) p. 21. *E. subangularis*, DesM., habitat natural holes ; FIELD (82) p. 83 : colour, bore into augite-lava ; STUDER (256) pp. 17 & 22. *E. vanbrunti*, A. Ag., boring holes ; FEWKES (80).

Echinoneus semilunaris, Lam. ; FIELD (82) p. 84.

†*Echinopedina*, Cott., defined, and *E. gacheti*, Desm. sp., redescribed ; COTTEAU (44) pp. 619 & 620.

†*Echinopsis*, Agass., defined and discussed ; COTTEAU (44) p. 577. *E. arenata*, d'Arch. sp., see *Arachniopleurus*. *E. elegans*, Desm. sp., redescribed, structure of poriferous plates, a pauci-granulate variety; *op. cit.* p. 579. *E. libycus*, Lor. ; *op. cit.* p. 587. *E. pusilla*, F. A. Röm., referred to *Zeuglopleurus* ; SCHLUETER (236) p. 207.

E. biarritzensis, Upper Eocene, near Biarritz, p. 585, *E. degrangei*, Middle Eocene of Plassac in Gironde, p. 583, COTTEAU, Pal. franc., Ech. Tert. ii : n. spp.

†*Echinospatagus breyniusi*, d'Orb., redescribed ; LAMBERT (145) p. 93. †*E. collignoi*, see *Toxaster*.

Echinostrephus molare, A. Agass. ; STUDER (256) p. 216.

Echinothrix desori, Agass., a small specimen described ; LORIOL (154) p. 362.

Echinothuriæ, apical system ; AGASSIZ (2) p. 77.

Echinus, Agass. ; BELL (16) 145. *E. acutus*, Lam. ; BELL (16) p. 146 : a parasitic Turbellarian ; CUÉNOT (60). *E. alexandri*, Dan. & Kor., redescribed and figured ; DANIELSSEN (62) p. 1. *E. angulosus*, Leske sp., variation in colour ; MEISSNER (181) p. 184. †*E. bolivarii*, d'Orb., see *Diplopodia texanum*. *E. diadema*, Stud., distribution ; STUDER (256) pp. 149 & 163. *E. elegans*, Düb. & Kor. ; BELL (16) p. 154, DANIELSSEN (62) p. 4. *E. esculentus*, Linn. ; BELL (16) p. 152, DANIELSSEN (62) p. 4, EFISIO (73) p. 252, PETERSEN (216) p. 39, NORDGAARD (201) pp. 5 & 10 : very depressed form ; SCOTT (238) p. 49 : depressed and lofty vars. ; SCOTT (339). *E. flemingi*, Forbes ; DANIELSSEN (62) p. 4, NORDGAARD (201) pp. 5 & 10. †*E. glandarius*, Fraas, see *Cidaris*. †*E. leymeriei*, Cott., see *Sphaerechinus*. *E. magellanicus*, Phil. ; STUDER (256) pp. 283 & 285. *E. margaritaceus*, Lam. ; STUDER (256) pp. 288 & 289. *E. melo*, Lam. ; EFISIO (73) p. 252. *E. microstoma*, W. Thoms. ; BELL (16) p. 149. *E. microtuberculatus*, Blainv., segmentation and development experimentally investigated ; DRIESCH (68, 69, 70) and HERBST (116, 118) : development ; PENARD (210) : alimentary canal ; FRENZEL, (88) p. 101: spermatogenesis ; FIELD (83). *E. miliaris*, Gmel. ; BELL (16) p. 150,

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PETERSEN (216) p. 40: amœbocytes; CUÉNOT (54) p. xi. ***E. norvegicus***, Düb. & Kor.; BELL (16) p. 147, PETERSEN (216) p. 40, STEINDACHNER (254) p. 446: distribution, compared with ***E. rarispinus***, Sars.; DANIELSSEN (62) p. 3: variations in Mediterranean form; MARENZELLER (166) p. 66. ***E. pileolus***, Lam.; EFISIO (73) p. 252. ***E. spatagus***, Linn., see ***Metalia maculosa***. ***E. sphaera***, Müll., a parasitic Turbellarian; CUÉNOT (60): see also ***E. esculentus***.

†***Enallaster*** :—***E. delgadoi***, de Lor.; AGUILERA (4) p. 26. ***E. mexicanus***, Cott.; *loc. cit.* ***E. texanus***, Room. sp., redescribed, and held to include ***E. peruvianus***, Gabb, and possibly ***Spatangus columbianus***, Lea; CLARK (36) p. 78.

E. obliquatus, Fredericksburg formation of Comanche series, Lower Cretaceous, Austin and Glen Rose, Texas, CLARK, Bull. U.S. Geol. Surv. No. 97, p. 79, n. sp.

†***Entomaster***, Gauthier, discussed; LAMBERT (146) p. 95.

†***Eocidaris keyserlingi***, Gein.; GEINITZ (96) p. 178.

†***Ediadema granulata***, Dunc.; WOODWARD (276) p. 370.

†***Epiaster*** :—***E. brevis***, Schlüt., Senonian of Angoulême; ARNAUD (9) p. 27. ***E. elegans***, Shum. sp., redescribed; CLARK (36) p. 80. ***E.*** (?) sp. indet.; HILL (122) p. 21. ***E. whitei***, Clark, redescribed, equals ***Toxaster elegans***, Conrad *non* Shumard; CLARK (36) p. 82.

†***Euspatangus***:—***E. cossoni***, Gauth., redescribed, p. 649; ***E. croizieri***, Cott., variation in tubercles, pp. 639 & 655; ***E. cruciatus***, Pomel sp., redescribed, p. 642; ***E. hagenmulleri***, Per. & Gauth., redescribed, p. 645; ***E. meslei***, Gauth., redescribed, p. 653; COTTEAU (44). ***E. murrayensis***, Laube; BITTNER (21) p. 365. ***E. prevosti***, Desor sp.; COTTEAU (44) p. 639. ***E. rotundus***, Dunc.; BITTNER (21) p. 365. ***E. subrostratus***, Per. & Gauth., redescribed; COTTEAU (44) p. 647.

E. biarritzensis, p. 656, and ***E. vidali***, p. 640, Eocene near Biarritz, COTTEAU, Pal. franc., Ech. Tert. ii: n. spp.

Fibularia, Lam., redescribed and discussed; *op. cit.* p. 390. †***F. lorioli***, Thom. & Gauth., redescribed; *op. cit.* p. 391. ***F. ovulum***, Lam.; EFISIO (73) p. 252. ***F. volva***, Agass.; STUDER (256) p. 181.

†***F. gregata***, n. sp., with n. var. ***orbiculus***, p. 347, and †***F. tatei***, n. sp., p. 348, Tertiary, Australia; BITTNER, SB. Ak. Wien, ci, Abth. 1. But TATE (257) p. 192, says ***F. gregata*** is very variable, and includes the other two forms.

Fibularidæ, discussed; COTTEAU (44) p. 385.

†***Gagaria***, Duncan, defined and discussed, p. 523; ***G. atacica***, Cott. sp. redescribed, p. 525; ***G. biarritzensis***, Cott. sp., ditto, p. 533; ***G. frossardi***, Cott. sp., p. 543; ***G. lusseri***, Desor sp., p. 540; ***G. mokattanensis***, Cott. sp., p. 541; ***G. nummulitica***, Cott. sp., redescribed, p. 536; ***G. orbignyi***, Cott. sp., ditto, p. 537; ***G. superba***, Dames sp., p. 541; ***G. venustula***, Dunc. & Slad. sp., p. 543; ***G. vilanovæ***, Cott. sp., p. 542; COTTEAU (44).

G. gauthieri, p. 532, & ***G. pegoti***, p. 528, Middle Eocene of Aude, COTTEAU, Pal. franc., Ech. Tert. ii: n. spp.

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†*Galeaster*, Seunes, maintained ; LAMBERT (146) pp. 84 & 96.

†*Galeola*, Klein, a subgenus of *Echinocorys* ; LAMBERT (146) p. 97.

†*Galeraster*, n. g., with type *G. australiæ*, n. sp., Eocene, Mt. Gambier, Australia ; COTTEAU, Mem. Soc. zool. France, iii, p. 548 : referred to *Echinoneidæ* ; LAMBERT (146) p. 85.

†*Gauthieria*, apical system compared with that of *Cyphosoma* ; COTTEAU (42) p. 732. *G. radiata*, Sorign. sp., discussed and figured ; SCHLUETER (236) p. 201.

†*Glyphocyphus rugosus*, see *Hemidiadema rugosum*.

†*Glypticus hieroglyphicus*, Goldf. sp.; FOX-STRANGWAYS (87) II, p. 196.

Goniocidaris ; AGASSIZ (3) p. 80. *G. canaliculata*, Agass. ; STUDER (256) pp. 287 & 288. †*G. farringdonensis*, Wright sp., redescribed ; LAMBERT (145) p. 39.

†*G. arduennensis*, Aptian, Grandpré, LAMBERT, Bull. Soc. geol. France (3) XX, p. 44, n. sp.

†*Goniophorus lunulatus*, Agass., redescribed ; SCHLUETER (236) p. 155.

†*Goniopygus* :—*G. menardi*, Agass.; ROTHPLETZ (224) p. 103. *G. royanus*, Danian of Angoulême ; ARNAUD (9) p. 41. *G. zitteli*, Clark, redescribed and now first figured ; CLARK (36) p. 53.

†*Guettaria*, Gauthier, discussed : LAMBERT (146) p. 96.

†*Hagenowia*, Dunc., probably one of the *Pourtalesidæ* ; *loc. cit.*

†*Hebertia*, Michelin, defined, p. 588; *H. meridanensis*, Cott., redescribed, p. 591 ; *H. parisiensis*, Mich., redescribed, p. 589 ; *H. sentisiana*, Desor, p. 593 ; COTTEAU (44).

Hemiaster ; AGASSIZ (3) p. 81. †*H. californicus*, Clark, redescribed and now first figured ; CLARK, Bull. U. S. Geol. Surv. No. 97, p. 90. *H. cavernosus*, Phil., sexual dimorphism, protection of ova, colonial habit ; STUDER (256) pp. 142, 163, & 287. †*H. cubicus*, Desor ; ROTHPLETZ (224) p. 103. †*H. dalli*, Clark, redescribed and now first figured ; CLARK (36) p. 89. †*H. excavatus*, Senonian of Angoulême ; ARNAUD (9) p. 29. †*H. gabrielis*, Per. & Gauth. ; FICHEUR (81) p. 411. †*H. humphreysanus*, Meek & Hayden, redescribed ; CLARK (36) p. 88. †*H. krenchelensis*, Per. & Gauth. ; ROTHPLETZ (224) p. 103. †*H. latigrunda*, Per. & Gauth., 4-rayed specimen ; COTTEAU (39) p. 540. †*H. ligeriensis*, Senonian of Angoulême ; ARNAUD (9) p. 29. *H. mentzii*, A. Agass.; STUDER (256) p. 22. †*H. moulinsanus*, Danian of Angoulême ; ARNAUD (9) pp. 35 & 42. †*H. nasutulus*, Sorignet ; FALLOT (78) p. 361 : Danian and Senonian of Angoulême ; ARNAUD (9) pp. 27, 28, 29, 35, & 42. †*H. parastatus*, Morton sp., redescribed ; CLARK (36) p. 83. †*H. planedeclivis*, Greg., redescribed and figured ; BITTNER (21) p. 366. †*H. proclivis*, Per. & Gauth.; FICHEUR (81) p. 411. †*H. prunella*, Desor, abnormal disappearance of fasciole and development of semicircular grooves in posterior region ; COTTEAU (42) p. 737 : Danian of Angoulême ; ARNAUD (9) p. 35. †*H. regulusanus*, d'Orb., figured ; FRIČ (89) p. 112. †*H.* sp. ; TOMMASI (262) p. 116. †*H. stella*, Morton sp., redescribed and held to include *H. wetherbyi*, de Lor., and *H.*

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incrassatus, Clark ; CLARK (36) p. 84. †*H. stella* (*angustipneustes*), Des., Senonian of Angoulême; ARNAUD (9) p. 25. †*H. texanus*, Roem., redescribed and held to include *H. americanus*, Giebel, and possibly *Periaster australis*, Gabb ; CLARK (36) p. 86. †*H. ungula*, Morton sp., redescribed ; CLARK (36) p. 85.

†*H. calvini*, Shoal Creek Limestone, top of Comanche series, Lower Cretaceous, Travis Co., Texas, CLARK, Bull. U. S. Geol. Surv. No. 97, p. 90, n. sp.

†*Hemicidaris*:—*H. hoffmanni*, F. A. Roem.; SMITH (250) p. 346. *H. intermedia*, Flem. sp. ; FOX-STRANGWAYS (87) II, p. 196, SMITH (250) p. 346, GREPPIN (104) p. 99. *H. langrunensis*, in *Terebratula maxillata*-beds near Basle ; GREPPIN (103). *H., cf. oblique-lineata*, Stopp. sp., spines only ; SIMONELLI (246) p. 243. *H.* sp., Lower Lias, Calabria; GRECO (100) p. 79.

H. bigoti, Toarcian of May in Calvados, COTTEAU, Mem. Soc. zool. France, vi, p. 345 ; *H. intumescens*, Jurassic, Taylorsville, California, CLARK, Bull. U. S. Geol. Surv. No. 97, p. 44 : n. spp.

†*Hemidiadema*, re-diagnosed and maintained, and *H. rugosum*, Agass., redescribed from fresh material ; LAMBERT (145) p. 68.

†*Hemipedina* :—*H. bechei*, Brod., *H. bowerbanki*, Wright ; WOODWARD (276) p. 370. *H. corallina*, Wright; FOX-STRANGWAYS (87) II, p. 196. *H. etheridgei*, Wright, *H. jardini*, Wright ; WOODWARD (276) p. 370. *H. struckmanni*, Dames ; SMITH (250) p. 346. *H. tomesi*, Wright; WOODWARD (276) p. 370, FOX-STRANGWAYS (87) II, p. 32. *H. woodwardi*, Wright; FOX-STRANGWAYS (87) II, p. 145.

†*Hemipneustes*, Agass., described and discussed ; COTTEAU (38) p. 1 : discussed ; LAMBERT (146) pp. 79 & 95. *H. africanus*, Desh.; COTTEAU (38) p. 7. *H. cotteaui*, Lambert, compared with *H. arnaudi*; COTTEAU (42) p. 734 : syn. of *H. tenuiporus*; COTTEAU (38) p. 10. *H. delettrei*, Coq. ; COTTEAU (38) p. 8. *H., cf. delettrei*, Danian of Angoulême ; ARNAUD (9) p. 35. *H. italicus*, Manzoni, a doubtful form ; LAMBERT (146) p. 95. *H. leymeriei*, Héb.; COTTEAU (38) p. 8. *H. marticensis*, Cott. sp.; *op. cit.* p. 9. *H. pyrenaicus*, Héb., p. 8; COTTEAU (38), FALLOT (78) p. 358. *H. semistriatus*, d'Orb. sp.; COTTEAU (38) p. 9. *H. striato-radiatus*, Leske ; *op. cit.* p. 7. *H. tenuiporus*, Cott. sp., discussed ; *op. cit.* p. 10.

H. arnaudi, Upper Senonian of Sergeac in Dordogne ; COTTEAU, Mem. Soc. zool. France, v, p. 733, *H. oculatus*, Upper Senonian, Ciply, COTTEAU, Mem. Soc. malac. Belgique, XXV, p. 4 : n. spp.

†*Heteraster texanus*, Roem.; AGUILERA (4) p. 26.

Heterocentrotus mamillatus, Agass.; LORIOL (154) p. 374.

†*Heterocidaris wickensis*, Wright sp.; FOX-STRANGWAYS (87) II, p. 145.

†*Heterodiadema libycum*, Cott. ; FICHEUR (81) p. 412.

†*Heteropneustes*, Pomel, emended ; *H. cotteaui*, Pomel, and *H. semistriatus*, Pomel, referred to *Hemipneustes* ; LAMBERT (146) p. 95.

Hipponoë esculenta, A. Agass., protection ; FIELD (82) p. 83, STUDER (256) p. 22. *H. variegata*, Leske, carries sea-weed to protect ova ; STUDER (256) p. 235.

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†*Holaster*, Agass., discussed; LAMBERT (146) p. 94. *H. australiæ*, Duncan, referred to *Lampadocorys*; *op. cit.* p. 97. *H. latissimus*, Agass., redescribed, stages of growth, and monstrosity; LAMBERT (145) p. 89. *H. placenta*, ? Agass., figured; FRIČ (89) p. 111. *H. planus*, Agass., varieties; CAYEUX (28) p. 119: discussed, type of new genus *Sternotaxis*; LAMBERT (146) p. 74. *H. pyriformis*, Per. & Gauth., referred to *Lampadocorys*; *op. cit.* p. 97. *H. semistriatus*, d'Orb., referred to *Hemipneustes*; COTTEAU (38) p. 9. *H. simplex*, Shum., redescribed and held to include *H. comanchesi*, Marcou; CLARK (36) p. 76.

Holaster, Craie glauconifère de Bohéries, Aisne, CAYEUX (28) p. 119, n. sp.

†*Holectypus*:—*H. afer*, Per. & Gauth.; FICHEUR (81) p. 401. *H. castilloi*, Cott.; AGUILERA (4) p. 26. *H. corallinus*, d'Orb.; SMITH, (250) p. 346. *H. depressus*, Leske; FOX-STRANGWAYS (87) II, pp. 145 & 196: in Discoideen-mergel, near Basle; GREPPIN (103). *H. oblongus*, Wright; FOX-STRANGWAYS (87) II, p. 196. *H. planatus*, Roem., redescribed, held to include *H. planus*, and possibly *H. castilloi*; CLARK (36) p. 58. *H. sarthacensis*, Cott.; GREGORY (102) p. 7. ? *H. simplex*, Shum.; CLARK (36) p. 93. *H. turonensis*, Senonian of Angoulême; ARNAUD (9) p. 29.

Homolampas; AGASSIZ (3) p. 81.

†*Homotoechus*, n. g., for reception of *Archaeocidaris hartiana*, Baily, Lower Carboniferous, Donegal, the name of which is [unwarrantably] changed to *H. hartii*: SOLLAS, P. Dublin Soc. vii, p. 152.

†*Hyboclypeus agariciformis*, Forbes; FOX-STRANGWAYS (87) II, p. 145. †*H.*, sp. ind.; SIEMIRADZKI (244) p. 144.

†*Infraclypeus thalebensis*, Per. & Gauth.; FICHEUR (81) p. 401.

†*Infulaster*, Hag., discussed; LAMBERT (146) p. 96. *I.* sp., Bohéries, Aisne; CAYEUX (28) p. 119.

†*Jeronia*, Seunes, discussed; LAMBERT (146) p. 98.

Laganum depressum, Less.; STUDER (256) p. 181: young, LORIOL (154) p. 375. *L. fragile*, nomen nudum; MAZZETTI (177).

†*Lampadaster*, Cott., discussed; LAMBERT (146) p. 97.

†*Lampadocorys*, Pomel, discussed; *loc. cit.* p. 97.

†*Lanieria lanieri*, d'Orb.; AGUILERA (4) p. 26.

†*Leiocidaris*:—*L. australiæ*, Dunc., referred to *Cidaris striata*; COTTEAU (44) p. 447. *L. hemigranosus*, Shum. sp., details described and figured; CLARK (36) p. 38. *L. salviensis*, Cott., described from N. Germany; SCHLUETER (236) p. 26.

L. (?) *hilsii*, Neocomian, Achim, Brunswick, SCHLUETER, Abh. Preuss. geol. Landesanst. Heft 5, p. 28, n. sp.

†*Leiopedina*, Cott., defined and discussed, p. 612; *L. samusi*, Pavay, redescribed, p. 616; *L. tallavignesi*, Cott., redescribed, p. 613; COTTEAU, Pal. franc., Ech. Tert. ii.

†*Leiosoma*, Cott., defined and discussed; *loc. cit.* p. 505. *L. biarritzense*, Cott., see *Micropeltis*. *L. tournoueri*, Cott.; FALLOT (78) p. 361.

L. bahezrei, Eocene, Pobla de Roda, in Aragon, COTTEAU, Pal. franc., Ech. Tert. ii, p. 506, n. sp.

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†*Lenita* and *L. patellaris*, Leske sp., redescribed ; COTTEAU (44) p. 378.

†*Linthia* :—*L.* sp., AGUILERA (4) p. 26. *L. tumidula*, Clark, redescribed and now first figured ; CLARK (36) p. 91.

L. alymensis, Cretaceous ?, Turkestan, ROMANOVSKII (223) p. 154, n. sp.

Lovenia elongata, Gray ; STUDER (256) p. 193 : Red Sea ; BOUTAN (24) p. 352.

L. gregalis, Bay of Bengal, 475 fathoms, ALCOCK, J. Asiat. Soc. Bengal, lxii, p. 175, n. sp.

†*Macropneustes* sp.; AGUILERA (4) p. 27.

Maretia, AGASSIZ (3) p. 81. †*M. grignonensis*, Desmar. sp., variety from Plateau du Four; COTTEAU (44) p. 636. *M. planulata*, Lam. ; LORIOL (154) p. 377.

†*M. savini*, Middle Eocene of Vallée du Trapel in Aude ; COTTEAU, Pal. franc., Ech. Tert. ii, p. 637, n. sp.

†*Melonites* : apical system ; AGASSIZ (2) p. 73.

†*M. indianensis*, St. Louis Group, Indiana, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 5, n. sp.

Meoma ventricosum, Lütk. ; FIELD (82) p. 84, STUDER (256) p. 22.

Metalia africana, Verrill ; STUDER (256) pp. 21 & 27. *M. maculosa*, Gmel. ; LORIOL (154) p. 376.

†*Metaporhinus convexus*, Cott. ; FICHEUR (81) p. 401.

†*M. minensis*, Corallian, Tiaret, Algeria ; GAUTHIER, C.R. Ass. Franc. 1889 (2) p. 435, n. sp.

†*Micraster* :—*M. aturicus*, Héb.; FALLOT (78) p. 353. *M.*, aff. *aturicus* et *heberti* ; FALLOT (77). *M. beonensis*, Gauthier, found in N. of France; PARENT (208) p. 22. *M. breviporus*, Agass., Craie glauconifère, and Craie a cornus, N. France, special varieties described and figured ; CAYEUX (28) pp. 120 & 135 : var., PARENT (207) p. 315. *M. brevis*, var. *turonensis*, Des., Senonian of Angoulême ; ARNAUD (9) pp. 25 & 27. *M. coranguinum*, var., Senonian, Lille ; PARENT (206) p. 18. *M. corbovis*, Forbes ; PARENT (207) p. 315 : var., PARENT (208), p. 23. *M. cor-testudinarium*, Agass. ; CAYEUX (28) p. 120, MICHAEL (184) p. 243 : varr., PARENT (207) p. 315. *M. lorioli*, Novak, figured; FRIČ (89) p. 110. *M. etheridgei*, Johnston, referred to *Monostychia* ; TATE (257) p. 192. *M. laxoporus*, Senonian of Angoulême ; ARNAUD (9) pp. 27 & 29. *M. normanniæ*, Bucaille ; PARENT (207) p. 316 : in Chalk with *M. cor-bovis*, Haut-Boulonnais; PARENT (206) p. 21. *M. sanctæ-mauræ*, Gauthier, from zone of *M. breviporus*, Cambrésis, near Lille ; PARENT (206) p. 20. *M.* sp. ; AGUILERA (4) p. 26.

M. bucailli [? by error for *bucaillei*], p. 15, *M. cayeusi* [? by error for *cayeuxi*], p. 13, *M. gauthieri*, p. 10, and (208) p. 23, Senonian, Lille, PARENT, Ann. Soc. géol. Nord. xx ; *M. gosseleti*, Chalk, zone of *M. cor-testudinarium*, Ronchin, near Lille, CAYEUX, Ann. Soc. geol. Nord. xvii, p. 180 ; *M.*, Cretaceous, zone of *Epiaster brevis*, Dannes, Boulonnais, PARENT, Ann. Soc. géol. Nord, xx, p. 316 ; *M.*, Craie glauconifère de Quiévy, CAYEUX (28) p. 120 ; *M. sweeti*, Desert

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Sandstone, Upper Cretaceous, Maryborough, Queensland, ETHERIDGE (76) p. 559 : n. spp.

†*Micropedina, cf. olisiponensis*, Forbes ; ROTHPLETZ (224) p. 103.

†*Micropeltis*, Pomel, defined and discussed ; COTTEAU, Pal. franc., Ech. Tert. ii, p. 517. *M. biarritzensis*, Cott., sp., redescribed and now first figured ; *op. cit.* p. 519.

M. vidali, Middle Eocene, Biarritz, *op. cit.* p. 521, n. sp.

†*Micropsina*, n. g., with type, *M. baudoni*, n. sp., Eocene, near Grignon, in Seine-et-Oise and Mouchy-le-Chalet in Oise; COTTEAU, *op. cit.* p. 629.

†*Micropsis* :—*M. biarritzensis*, Cott., *M. frossardi*, Cott., *M. nummulitica*, Cott., *M. orbignyi*, Cott.; see *Gagaria*. *M. samperi*, Cott., see *Coptosoma*. *M. tremadesi*, Cott., referred to *Gagaria vilanovæ* ; COTTEAU (44) p. 542. *M. venustula*, Dunc. & Slad., see *Gagaria*.

Moira ; AGASSIZ (3) p. 81.

†*Monostychia australis*, Laube, discussed and figured ; BITTNER (21) p. 345. †*M. etheridgei*, Johnston sp. ; TATE (257) p. 192.

Neolampas and *N. rostellata*, A. Agass. ; BELL (16) p. 162.

†*Nucleolites* :—*N. cerceleti*, Desor, see *Phyllobrissus cerceleti*. *N. minor*, Desor sp. ; FALLOT (78) p. 361. *N. subcarinatus*, Goldf., referred to *Tristomanthus* ; BITTNER (21) p. 355.

†*Offaster*, Desor, discussed, p. 97; *O. globulosus*, de Lor., doubtfully referred to *Physaster*, p. 92 ; LAMBERT (146).

†*Oligoporus blairi*, p. 6, Keokuk Group, Missouri, *O. bellulus*, p. 7, ditto, *O. sulcatus*, p. 8, St. Louis Group, Kentucky, MILLER & GURLEY, Bull. Ill. Mus. iii : n. spp.

†*Oolaster*, Laube, maintained ; LAMBERT (146) p. 97.

†*Opisopneustes*, Gauthier, discussed ; *op. cit.* p. 96.

†*Orthechinus boreaui*, Middle Dordonian of Maurens in Dordogne ; COTTEAU, Mem. Soc. zool. France, vi, p. 350 [ascribed to Arnaud, but apparently n. sp.].

†*Ortholophus lineatus*, Duncan, referred to *Paradoxechinus novus* ; TATE (257) p. 191 ; see also *Coptechinus*.

†*Orthopsis miliaris*, Cott., Danian and Senonian of Angoulême ; ARNAUD (9) pp. 41 & 25.

†*Palæchinus elegans* and *P. sphæricus*, M'Coy, apical system ; AGASSIZ (2) p. 73. *P. sphæricus* as a rock-former ; LOHEST (152).

Paleopneustes ; AGASSIZ (3) pp. 81 & 83.

†*Paradoxechinus novus*, Laube, described and figured ; BITTNER (21) p. 344 : very variable, and includes *Coptechinus lineatus* and *C. pulchellus*, Bittn. ; TATE (257) p. 191.

Parasalenia, A. Agass., defined and discussed ; COTTEAU (44) p. 631. †*P. fontannesi*, Cott., Helvetian of Grand Vallet in Rhone basin ; DEPÉRET (64) p. 433. *P. gratiosa*, A. Agass., Madagascar, with 4 anal plates ; MEISSNER (182).

†*P. gosseleti*, Eocene of Cassel, Nord.; COTTEAU, Pal. franc., Ech. Tert. ii, p. 633, n. sp.

†*Pedina*:—*P. sublaevis*, Agass. ; SMITH (250) p. 346.

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P. grossouvrei, between Bajocian and Bathonian, near Loudun, Maine-et-Loire, COTTEAU, Mem. Soc. zool. France, vi, p. 344, n. sp.

†*Pedinopsis pondi*, probably from the lower portion of the Austin chalk, Upper Cretaceous, Onion Creek, Travis Co., Texas, CLARK, Bull. U. S. Geol. Surv., No. 97, p. 57, n. sp.

†*Peltastes* :—*P. clathratus*, Agass. sp., redescribed; SCHLUETER (236) p. 148. *P. cf. heliophorus*, Agass. sp., Senonian, Baltic provinces; *op. cit.* p. 152. *P. lardyi*, Desor sp., redescribed, with varieties and young; LAMBERT (145) p. 76. *P. meyeri*, Desor sp., and *P. punctatus*, Agass., referred to *P. stellulatus*, Agass.; *op. cit.* pp. 75 & 76. *P. stellulatus*, Agass. sp., redescribed; SCHLUETER (236) p. 145.

†*Periaster australis*, Gabb, see *Hemiaster texanus*.

†*Peronella decagonalis*, Lesson sp., New Guinea; ETHERIDGE (76) pp. 692 & 697.

Phormosoma, W. Thoms.; AGASSIZ (3) pp. 79, 80, & 83, BELL (16) p. 143. *P. placenta*, W. Thoms.; BELL (16) p. 144. *P. uranus*, W. Thoms.; BELL (16) p. 145.

Phyllacanthus baculosa, spines covered with algæ; BOUTAN (24) p. 53. †*P. sindensis*, Dunc. & Slad., referred to *Rhabdocidaris*; COTTEAU (44) p. 464.

†*P. tirsiger*, SIMONELLI (245) p. 234, n. sp.

†*Phyllobrissus cerceleti*, Desor sp., redescribed, and systematic position discussed; LAMBERT (145) p. 84.

†*Phymosoma radiatum*, Schl.; FRIČ (89) p. 109.

†*Pithodia*, see *Discoides*.

Plagiechinus, Pomel, rejected; COTTEAU (44) p. 632.

†*Plagiochasma*, Pomel, syn. of *Trematopygus*, d'Orb.; LAMBERT (146) p. 69.

†*Plesiocorys*, Pomel, rejected; LAMBERT (146) p. 94.

†*Pleurocidaris regalis*, Goldf. sp., redescribed and discussed; SCHLUETER (236) p. 136.

†*Pliolampas meslei*, Cott., Helvetian of Valduc; DEPÉRET (64) p. 448.

†*Polydiadema*, discussed and defended; LAMBERT (145) p. 48. *P. bonei*, Forbes sp., Upper Greensand, Warminster, distinguished from *Tiarella michelini* at same locality; LAMBERT (145) p. 58.

P. cotteaui, Aptian, Grandpré; LAMBERT, Bull. Soc. geol. France (3) xx, p. 54, n. sp.

†*Porocidaris*, Desor; AGASSIZ (3) p. 80: defined and discussed; COTTEAU (44) p. 465. *P. anomala*, Dunc. & Slad.; COTTEAU (44) p. 478. *P.* (?) *lingualis*, Desor, discussed; SCHLUETER (236) p. 134. *P. pseudoserrata*, Cott. sp., redescribed; COTTEAU (44) p. 474. *P. schmideli*, Münst. sp., redescribed; *op. cit.* p. 468. *P. tuberculosa*, Mich.; *op. cit.* p. 478.

P. cretacea, name doubtfully given to spine-fragment, Upper Senonian, Rügen, SCHLUETER, Abh. Preuss. geol. Landesanst. Heft. 5, p. 131, n. sp. (?)

Pourtalesia; AGASSIZ (3) pp. 77, 79, & 83. *P. jeffreysii*, A. Agass.; DANIELSSEN (62) p. 5.

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†*Progonolampas*, n. g., with type *P. novæ-hollandiæ*, n. sp., Tertiary, Australia ; BITTNER, SB. Ak. Wien, ci, Abth. 1, p. 359 : syn. of *Echinolampas posterocrassus*, Greg ; TATE (257) p. 193.

†*Psammechinus*, Agass., defined ; COTTEAU (44) p. 624. *P. biarritzensis*, Cott., redescribed ; *op. cit.* p. 625. *P. cingulatus*, Clark, redescribed and now first figured ; CLARK (36) p. 55. *P. dubius*, Agass. ; ROTHPLETZ (224) p. 103. *P. gravesi*, Desor ; COTTEAU (44) p. 628. *P. homocyphus*, Des. ; SIMONELLI (245) p. 228. *P. monilis*, Desm. ; SIMONELLI (245) p. 232, TOULA (265) p. 291. *P. orbignyi*, Cott., see *Gagaria*. *P. spadæ*, Des. ; SIMONELLI (245) p. 228. *P. woodsi*, Laube, redescribed and figured, with n. var. *fasciger*, Tertiary, Australia ; BITTNER (21) p. 335 : very variable, and includes var. *fasciger* and *P. humilior* of Bittner ; TATE (257) p. 191.

P. (?) *humilior*, Tertiary of Australia, BITTNER, SB. Ak. Wien, ci, Abth. 1, p. 337 ; synonym of *P. woodsi*, TATE (257) p. 191 : n. sp.

†*Pseudananchis*, Pomel, maintained ; LAMBERT (146) p. 97.

†*Pseudocidaris saussurei*, de Lor. ; AGUILERA (4) p. 26. †*P. thurmanni*, Et. ; SMITH (250) p. 346.

†*P. unigranulatas*, Jurassic, Cutch, GREGORY, Pal. Ind., ser. ix, vol. ii, Pt. 1, p. 3, n. sp.

†*Pseudodiadema* :—*P. depressum*, Agass. sp. ; FOX-STRANGWAYS (87) II, p. 145. *P. diatretum*, Morton sp., redescribed ; CLARK, Bull. U. S. Geol. Surv. No. 97, p. 46. *P. hemisphericum*, Agass. ; FOX-STRANGWAYS (87) II, p. 197. *P. lobatum*, Wright ; WOODWARD (276) p. 370. *P. malbosi* ? Desor ; AGUILERA (4) p. 26. *P. mammillatum*, F. A. Roem. ; SMITH (250) p. 346. *P. minutum*, Buckm. sp. ; STUBER (255) p. 105. *P. moorei*, Wright ; WOODWARD (276) p. 370. *P. pentagonum*, M'Coy sp. ; FOX-STRANGWAYS (87) II, p. 145. *P. renevieri*, Cott., see *Diplopodia renevieri*. *P. roemeri*, Clark, a synonym of *P. texanum* ; CLARK (36) p. 47. *P.* sp. ; GREGORY (102) p. 7. *P. slateri*, Blake ; FOX-STRANGWAYS (87) II, p. 32. *P. tenue*, Desh. ; ROTHPLETZ (224) p. 103. *P. texanum*, Roem. sp., redescribed ; CLARK (36) p. 47. *P. vagans*, Phill. sp. ; FOX-STRANGWAYS (87) II, p. 145. *P. versipora*, Wright ; FOX-STRANGWAYS (87) II, p. 197.

P. cutchensis, Jurassic, Cutch, GREGORY, Pal. Ind., ser. ix, vol. ii, Pt. 1, p. 5 ; *P. emersoni*, Jurassic, Taylorsville, California, CLARK, Bull. U. S. Geol. Surv. No. 97, p. 45 : n. spp.

†*Pseudoholaster*, Pomel, discussed and emended ; LAMBERT (146) p. 94.

†*Psilosoma*, Pomel, validity discussed ; COTTEAU (46) p. 351.

†*Pygaster semisulcatus*, Phill. sp., p. 146 ; †*P. umbrella*, Agass., p. 197 ; FOX-STRANGWAYS (87) II.

†*P. welschi*, Corallian, Tiaret, Algeria, GAUTHIER, C.R. Ass. Franc. 1889 (2) p. 433, n. sp.

†*Pygaulus barthi*, p. 262, and †*P. kelleri*, p. 261, Neocomian, Somaliland, MAYER-EYMAR, Vierteljahrschr. Ges. Zurich, XXXVIII : n. spp.

†*Pygorhytis*, Pomel, emended and restricted to species with a floscelle ; GREGORY, Pal. Ind., ser. ix, vol. ii, Pt. 1, p. 10.

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P. tumulus, Jurassic, Cutch, *op. cit.* p. 11, n. sp.

†*Pygurus* :—*P. geometricus*, Morton sp.; CLARK (36) p. 92. *P. haus-manni*, Koch & Dunk. sp.; FOX-STRANGWAYS (87) II, p. 197. *P. jurensis*, Marcou; SMITH (250) p. 346. *P. pentagonalis*, Phill. sp., p. 197, *P. phillipsi*, Wright, p. 198; FOX-STRANGWAYS (87) II.

†*Pyrina* :—*P. flava*, Arnaud, with buccal plates; COTTEAU (39) p. 539. *P. parryi*, Hall; AGUILERA (4) p. 26: redescribed; CLARK (36) p. 59. *P.* sp., Cretaceous, Balkans; VANKOV (266) p. 97.

†*Radiocyphus villanovæ*, Cott., referred to *Arachniopleurus*; COTTEAU (44) p. 603.

Rhabdocidaris, Desor, defined and discussed; COTTEAU (44) p. 451. *R. annulifera*, Lam., described, distinguished from *R. baculosa*, and extended over *Schleinitzia crenularis* and *Cidaris lutkeni*; LORIOL (154) p. 360. †*R. caprimontana*, Desor sp.; SIEMIRADZKI (244) p. 143. †*R., cf. cometus*, Boll, Upper Senonian, Rügen, spines only; SCHLUETER, (236) p. 23. †*R., cf. cylindrica*, Quenst., Tuapse, Caucasus; NEUMAYR & UHLIG (198) p. 3. *R. imperialis*, Lm.; LORIOL (154) p. 361. †*R. itala*, Laube sp., †*R. loveni*, Cott.; COTTEAU (44) p. 462. †*R. maxima*, Münst. sp.; FOX-STRANGWAYS (87) II, p. 146. †*R. mezzoana*, Laube sp.; COTTEAU (44) p. 461. †*R. moraldina*, Cott.; WOODWARD (276) p. 370. †*R. navillei*, Cott. sp.; COTTEAU (44) p. 464. †*R. nobilis*, Goldf.; SIEMIRADZKI (244) p. 143. †*R., cf. nobilis*, Münst., Schachdagh, Caucasus; NEUMAYR & UHLIG (198) p. 4. †*R. pouechi*, Cott., redescribed with variations; COTTEAU (44) p. 456. †*R. pseudojurassica*, Laube; COTTEAU (44) p. 460. †*R. ranikoti*, Dunc. & Slad.; COTTEAU (44) p. 463. †*R. remus*, Desor; SIEMIRADZKI (244) p. 143. †*R. sindensis*, Dunc. & Slad. sp.; COTTEAU (44) p. 464. †*R.* sp.; GREGORY (102) p. 3, FOX-STRANGWAYS (87) II, p. 32, RETOWSKI (221) p. 288. †*R. subcoronata*, Münst. sp.; OGILVIE (205) p. 51. †*R. suevica*, Desor; SIEMIRADZKI (244) p. 143. †*R. vidali*, Cott.; COTTEAU, Pal. franc., Ech. Tert. ii, p. 465. †*R. zitteli*, Lor.; *t. c.* p. 463.

†*R. blancheti*, Upper Eocene near Biarritz, COTTEAU, Pal. franc., Ech. Tert. ii, p. 453; †*R. schloenbachi* (n. sp. ?), Neocomian, Sommerholze near Kniestedt, N. Germany, founded on spine-fragments, p. 20, †*R. triangularis*, Neocomian, Achim, Brunswick, founded on spines, p. 19, SCHLUETER, Abh. Preuss. geol. Landesanst. Heft 5 : n. spp.

†*Rhabdopleurus*, n. g., based on *Glyphocyphus ataxensis*, which is redescribed; COTTEAU (44) pp. 594 & 595.

†*Rhynchopygus marmini*, Danian of Angoulême; ARNAUD (9) pp. 35, 36, & 41.

Rotula augusti, Klein, crowd of young; STUDER (256) pp. 21 & 27. *R. rumphii*, Klein; STUDER (256) p. 21.

†*Salenia*, Gray; AGASSIZ (3) pp. 77 & 80: defined and discussed; COTTEAU (44) p. 479. *S. anthophora*, J. Müll., redescribed, figured, and discussed; SCHLUETER (236) p. 192. *S. areolata*, Wahlb. sp.,

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discussed ; SCHLUETER (236) p. 174, see also *S. quenstedti*. *S. bellula*, Clark, redescribed and now first figured ; CLARK (36) p. 43. *S. blanfordi*, Dunc. & Slad.; COTTEAU (44) p. 485. *S. bonnissenti*, Cott., referred to *S. anthophora* ; SCHLUETER (236) p. 192. *S. bourgeoisi*, Cott., in part referred to *S. maestrichtensis* ; SCHLUETER (236) p. 196 : Senonian of Angoulême ; ARNAUD (9) p. 27. *S. garciæ*, Cott.; COTTEAU (44) p. 484. *S. granulosa*, Forbes, redescribed and figured ; SCHLUETER (236) p. 164. *S. heberti*, Cott., redescribed and figured, with measurements of 12 specimens ; SCHLUETER (236) p. 179. *S. liliputana*, Geinitz, referred to *S. petalifera* ; SCHLUETER (236) p. 160. *S. loveni*, Cott., discussed ; SCHLUETER (236) p. 175. *S. mamillata*, Cott., compared with *Peltastes lardyi* ; LAMBERT (145) p. 77. *S. pellati*, Cott., redescribed ; COTTEAU (44) p. 482. *S. petalifera*, Desmarest sp., redescribed, discussed, and a monstrosity figured ; SCHLUETER (236) p. 160. *S. prestensis*, Desor ; AGUILERA (4) p. 26. *S. scutigera*, Senonian of Angoulême ; ARNAUD (9) pp. 28 & 29. *S. tertiaria*, Tate, redescribed and figured ; BITTNER (21) p. 333. *S. texana*, Credner ; CLARK (36) p. 40. *S. tumidula*, Clark, redescribed and now first figured ; CLARK (36) p. 41. *S. trigonata*, Senonian of Angoulême ; ARNAUD (9) p. 28. *S. villanovæ* is syn. of *S. grasi* ; COTTEAU (42) p. 472.

S. cylindrica (ascribed to Arnaud, but apparently n. sp.), Middle Dordonian of Meschers in Charente-Inférieure, COTTEAU, Mem. Soc. zool. France, vi, p. 346 ; *S. daleaui*, Middle Eocene, Plassac near Blaye, COTTEAU, Pal. franc., Ech. Tert. ii, p. 480 ; *S. gehrdensis*, Lower Senonian, Gehrden, S. Hannover, p. 170, *S. maestrichtensis*, Danian of Maestricht and Falkenberg, p. 196, *S. obnupta*, Upper Senonian, Berkum near Peine in Hannover, p. 190, *S. quenstedti*, new name for *S. areolata*, Quenst. *non* Wahlb., Lower Senonian, Quedlinburg, p. 176, SCHLUETER, Abh. Preuss. geol. Landesanst. Heft 5; *S. radians*, Lower Santonian or Coniacian of Rousselières in Charente, COTTEAU, Mem. Soc. zool. France, iii, p. 543 ; *S. sigillata*, Upper Cretaceous Drift from Baltic, Potsdam, SCHLUETER, Abh. Preuss. geol. Landesanst. Heft 5, p. 85 : n. spp.

Saleniadæ, apical system ; AGASSIZ (2) p. 78.

Salmacis rarispina, A. Agass.; STUDER (256) p. 263 : description of a neanic specimen ; LORIOL (154) p. 370. *S. sulcata*, Agass.; STUDER (256) p. 192. †*S. vanden-heckei*, Agass., see *Triplacidia*.

†*Sarsella forbesi*, Dunc.; BITTNER (21) p. 364. †*S. mauritanica*, Pomel, redescribed ; COTTEAU (44) p. 667.

Schizaster, Agass.; BELL (16) p. 163, AGASSIZ (3) pp. 77, 78, & 82. *S. capensis*, Stud., colour ; STUDER (256) pp. 52 & 55. *S. fragilis*, Dūb. & Kor.; BELL (16) p. 164, DANIELSSEN (62) p. 5. *S. moseleyi*, A. Agass., distribution ; STUDER (256) p. 163. †*S. parkinsoni*, Agass., Helvetian of Istres, Rhone Basin ; DEPÉRET (64) p. 454. *S. philippii*, Gray, colour ; STUDER (256) p. 288. *S.* sp., alimentary canal ; FRENZEL (88) p. 103.

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†*S. rosmeri*, Cretaceous, Silesia, LANGENHAN & GRUNDEY, Jahresb. d. Glatzer Gebirgs-Ver. x, p. 8, n. sp.

Schleinitzia crenularis, Stud., see *Rhabdocidaris annulifera*.

†*Scutella paulensis*, Agass., var., Helvetian of Rhone Basin; DEPÉRET (64) p. 426. †*S., cf. subrotunda*, Lam., Tertiary of Coro; ERNST (75) p. 339.

†*Scutellina*, redescribed, p. 306; *S. concava*, Thomas & Gauthier, redescribed, p. 345; *S. dufouri*, Cott., redescribed, p. 311; *S. incisa*, Defr. sp., redescribed and removed from *Sismondia*, p. 322; *S. lenticularis*, Lam. sp., redescribed and discussed, with its variations, p. 315; *S. michelini*, Cott., p. 307, *S. obovata*, Agass., p. 326, *S. rotunda*, Galeotti sp., p. 335, *S. supera*, Agass., p. 339, redescribed; COTTEAU, Pal. franc., Ech. Tert. ii.

†*S. blariensis*, Eocene, Calcaire de Blaye, Soussans, Bruges and Gironde, p. 331, *S. besançoni*, Eocene of Fontenay and Cahaignes, Eure, p. 330, *S. bonissenti*, Middle Eocene of Hauteville, Manche, p. 324, *S. calrimontana*, Middle Eocene of Oise and Eure, p. 343, *S. folium*, Eocene of Soussans, p. 333, *S. linderi*, Middle Eocene of Gironde, p. 313, *S. morgani*, Eocene, Mt. Gambier, Australia, p. 347, COTTEAU, Pal. franc., Ech. Tert. ii, n. spp.

†*Sismondia incisa*, see *Scutellina*.

Spatangidæ, morphological study of the plastron, and phylogenesis; LAMBERT (146).

Spatangus, Leske; BELL (16) p. 164. †*S., cf. austriacus*, Laube; TOULA (265) p. 288. †*S. ocellatus*, Defr.; ROTHPLETZ (224) p. 103. *S. purpureus*, Leske; BELL (16) p. 165, DANIELSSEN (62) p. 5, PETERSEN (216) p. 42, SIMONELLI (245) p. 218, STEINDACHNER (254) p. 446. *S. raschi*, Loven; BELL (16) p. 167, DANIELSSEN (62) p. 5. *S.* sp., alimentary canal; FRENZEL (88) p. 102. *S.* sp.?; EFISIO (73) p. 252. †*S. truncatus*, Goldf., referred to *Cibaster*; LAMBERT (146) p. 97.

†*S. macraulax*, n. sp., SIMONELLI (245) p. 220.

Sphærechinus, Desor; BELL (16) p. 158: structure of ovum; SCHNEIDER (237) p. 46. *S. granularis*, Lam.; BELL (16) p. 158: chemical stimulation of unfertilised eggs; HERBST (117): experimental investigation of development; DRIESCH (69, 68, 70), HERBST (116) 118): spermatogenesis; FIELD (83): alimentary canal; FRENZEL (88) p. 101: dorsal organ; LEIPOLDT (148) p. 595. †*S. leymeriei*, Cott. sp., redescribed and now first figured; COTTEAU (44) p. 623.

†*Stegaster*, Pomel, *em.* Seunes, discussed; LAMBERT (146) p. 97.

†*Stenonia*, Desor, discussed; LAMBERT (146) p. 98.

†*Stereocidaris*:—*S., cf. carteri*, Forbes sp., redescribed and figured, p. 86; *S. hirudo*, Sorign. sp., measurements of test, p. 99; *S. merceyi*, Cott. sp., redescribed and figured, p. 105; *S. punctillum*, Sorign. sp., discussed, p. 97; *S. reussi*, Gein. sp., redescribed and figured, p. 94; *S. sceptrifera*, König sp., redescribed and figured, p. 110: SCHLUETER, Abh. Preuss. geol. Landesanst. Heft 5.

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†*S. darupensis*, Upper Senonian, Darup and Coesfeld in Westphalia, p. 118, *hannoverana*, Cenomanian, Rethen in Hannover, p. 88, *silesiaca*, Turonian, Oppeln, in Silesia, p. 102, *subhercynica*, Turonian, Hannover and Harz, p. 91, SCHLUETER, Abh. Preuss. geol. Landesanst. Heft 5, n. spp.

†*Sternotaxis*, n. g., with type *Holaster planus* ; LAMBERT (146) p. 95.

†*Stomechinus* :—*S. aroviensis*, Desor sp.; SIEMIRADZKI (244) p. 143. *S. bigranularis*, Lam. sp.; *S. germinans*, Phill. sp.: FOX-STRANGWAYS (87) II, p. 146. *S. gyratus*, Agass. sp.: FOX-STRANGWAYS (87) II, p. 198. *S.* sp.; GREGORY (102) p. 7.

†*S. hyatti*, Jurassic, Taylorsville, California, CLARK, Bull. U. S. Geol. Surv. No. 97, p. 56, n. sp.

†*Strictechinus*, n. g., with type *S. pouechi*, n. sp., Upper Cretaceous, zone of *Echinanthus graçilis*, Haute-Garonne ; COTTEAU, Mem. Soc. zool. France, v, p. 737.

Strongylocentrotus, Brandt ; BELL (16) p. 155. *S. droebachiensis*, O. F. Müll. ; BELL (16) p. 156, DANIELSSEN (62) p. 4, SCOTT (238) p. 49 : boring habits ; FEWKES (79), GANONG (91) : variation in spines, *ib.*, p. 56 : examples with eight pairs of pores in an arc ; BUCKLEY in HERDMAN (120) p. 89. *S. franciscanus*, A. Agass., coast of British Columbia ; WHITEAVES (270) p. 133. *S. lividus*, Lam.; BELL (16) p. 157, EFISIO (73) p. 252 : sexual dimorphism in colour ; BEDDARD (13) p. 255 : a parasitic Turbellarian; CUÉNOT (60) : physiology and histology of gut ; FRENZEL (88) p. 95 : early development chemically experimented on ; HERBST (116). See also *Toxopneustes*.

†*Taphraster*, Pomel, reduced to subgeneric rank; LAMBERT (146) p. 94.

†*Temnechinus macleayana*, Ten.-Woods, New Guinea ; ETHERIDGE (76) pp. 691 & 697. *T. scillæ*, nomen nudum ; MAZZETTI (177).

†*Temnocidaris baylei*, Cott., spines first described and figured ; COTTEAU (46) p. 348: Danian of Angoulême; ARNAUD (9) p. 34. †*T. danica*, Desor sp., redescribed and figured ; SCHLUETER (236) p. 125.

Temnopleurus hardwicki, Gray sp., maintained ; MEISSNER (181) p. 184.

†*Thagaster* and *T. wetterlei*, Pomel, redescribed, with variations; COTTEAU (44) p. 386.

†*Tholaster*, Seunes, discussed ; LAMBERT (146) p. 97.

†*Thylechinus rejaudryi* [ascribed to Arnaud, but apparently] n. sp., Lower Campanian of Fugeras in Charente-Inférieure ; COTTEAU, Mem. Soc. zool. France, vi, p. 352.

†*Tiarechinus*, homologies discussed ; AGASSIZ (2) p. 80.

†*Tiarella michelini*, Agass. sp., distinguished from *Polydiadema bonei*, q.v. ; LAMBERT (145) p. 58.

†*Toxaster collegnoi*, Sism., Somaliland ; MAYER-EYMAR (175) p. 261. †*T. elegans*, Shum.; AGUILERA (4) p. 26.

Toxopneustes droebachiensis, Müll. ; NORDGAARD (201) p. 10 : variation and distribution ; PETERSEN (216) p. 40. *T. pallidus*, G. O. Sars ; NORDGAARD (201) pp. 5 & 10. *T. variegatus*, A. Agass., habitat algæ, protection : FIELD (82) p. 83. See also *Strongylocentrotus*.

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†*Trematopygus*, d'Orb., maintained; LAMBERT (146) p. 69. *T. crucifer*, Morton sp., redescribed; CLARK (36) p. 63.

†*Triplacidia*, Bittner, defined and discussed, p. 605; *T. fraasi*, Lor. sp., p. 609; *T. lorioli*, Cott. sp., p. 611; *T. stachei*, Bittner, p. 610; *T. vandenheckei*, Agass. sp., redescribed, p. 606; *T. veronensis*, Bittner, p. 611; COTTEAU (44).

Tripneustes variegatus, Agass.; LORIOL (154) p. 373.

†*Tristomanthus*, n. g., type *Catopygus elegans*, Laube; BITTNER, SB. Ak. Wien, ci, Abth. i, p. 355 : should be *Studeria*; TATE (257) p. 192. *T. elegans*, Laube sp., discussed, specimen with four ambulacra; BITTNER (21) p. 352.

Tripylus fragilis, Düb. & Kor.; NORDGAARD (201) p. 10.

†*Tuberaster*, defined and discussed, and *T. tuberculatus*, Per. & Gauth., redescribed; COTTEAU (44) p. 658.

†*Tylocidaris* :—*T. asperula*, F. A. Roem. sp., spines described and figured, p. 41; *T. bowerbanki*, Forbes sp., p. 40; *T. clavigera*, König sp., described, figured, and discussed, p. 45; *T. strombecki*, Desor sp., spines described and figured, p. 43; *T. velifera*, Bronn sp., described and discussed, p. 31; SCHLUETER, Abh. Preuss. geol. Landesanst. Heft. 5. *T. goseæ*, Lower Senonian, N. Germany, founded on spines, p. 52; *T. squamifera* (apparently a new name applied to certain spines from Chalk of Sweden, figured by Hisinger, Leth. Suec., tab. xxvi, fig. 5*b*), p. 52; *T. vexillifera*, Upper Senonian, Seeland, founded on spines, p. 54; SCHLUETER, Abh. Preuss. geol. Landesanst. Heft 5 : n. spp.

†*Urechinus*, A. Agass.; AGASSIZ, (3) pp. 77, 81, & 83, LAMBERT (146) p. 98.

†*Zeuglopleurus*, Greg., discussed; SCHLUETER (236) p. 205.

(D.)—ASTEROIDEA.

Classification of the Class; PERRIER (213) pp. 847–854.

Acanthaster echinites, Ellis & Sol., fifteen arms, of which three are not developed and the rest unequal, detailed description, separated from *A. ellisi*; LORIOL (154) p. 387. *A. ellisi*, Gr.; STUDER (256) pp. 248 & 256 : see also *A. echinites*.

Anthenea pentagonula, Lam.; STUDER (256) pp. 192 & 193.

Anthenoides sarissa, Andaman Sea, 130–250 fms.; ALCOCK, Ann. Nat. Hist. (6) xi, p. 99, n. sp.

Archaster typicus, M. & T.; MARTENS (171) p. 184, STUDER (256) pp. 248 & 256 : variations in *pedicillaria* and spines; LORIOL (154) p. 378.

Aspidosoma tischbeinianum, F. Roem., marginals; HALFAR (111A) p. 195.

†*A. petaloides*, Simon., n. var. *goslariensis*, Lower Devonian, Haupt-Kahlebergsandstein of Goslar, Harz; HALFAR, Jahrb. preuss. Landesanst. xiii, p. 186.

Asteracanthion rubens, Linn.; NORDGAARD (201) p. 9 : in Eastern Baltic; KOJEVNIKOV (143) p. 141.

Asterias, Norman; BELL (16) p. 97. *A. amurensis*, Lütk.; MEISSNER

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(179) p. 183. *A. antarctica*, Lütk.; STUDER (256) p. 285. *A. bellii*, Stud.; STUDER (256) p. 286. †*A.* ? *dubium*, Whitf.; CLARK (36) p. 31. *A. forbesi*, Verrill, ova fertilised by sperm of *Arbacia*; MORGAN (196): a southern sp. found in Oak Bay, New Brunswick; GANONG (91) p. 54: eye described; WATASE (269) p. 324. *A. fragilis*, Stud., autotomy; STUDER (256) p. 269. *A. glacialis*, Linn.; BELL (16) p. 98, MEISSNER (179) p. 183, PETERSEN (216) p. 43: madreporite compared with *Euspirocrinus*; BATHER (11) p. 112: digestion; CHAPEAUX (32): spermatogenesis; FIELD (83): early stages of development; RUSSO (229): six-rayed variation; ROBERTSON (223). *A. hartti*, Rathb., six or seven rays, two usually short; STUDER (256) p. 292. *A. hispida*, Penn.; BELL (16) p. 103: 18½ fms., Beauly Firth, Inverness; SCOTT (240) p. 81. *A. littoralis*, Stimpson sp., intense Prussian blue colour; GANONG (91) p. 55. *A. mazophorus*, Alcock & W.-M., redescribed; ALCOCK (6) p. 115. *A. membranacea*, Lam.; EFISIO (73) p. 252. *A. meridionalis*, Perr., colour, distribution; STUDER (256) pp. 144, 145, & 164. *A. muelleri*, Sars; BELL (16) p. 100, PETERSEN (216) p. 43: spontaneous division and regeneration; DANIELSSEN (61) p. 12. *A. murrayi*, Bell; BELL (16) p. 103. *A. perrieri*, Smith, distribution; STUDER (256) pp. 140 & 164. *A. prisca*, Goldf., Brauner Jura *β*, Donzdorf, Swabia, figured; ENGEL (74) p. liii. *A. richardi*, Perr., normally six-armed in young; MARENZELLER (166) p. 66, and STEINDACHNER (254) p. 445. *A. rubens*, Linn.; BELL (16) p. 100, PETERSEN (216) p. 42: blood and water-vascular systems; CHADWICK (30): amœbocytes; CUENOT (54) p. xi: alimentary canal; FRENZEL (88) p. 105: var. *attenuata*, Hodge; BELL (16) p. 102: see also under *A. vulgaris*. *A. rugispina*, Stimps.; STUDER (256) p. 285 & 289. *A. rupicola*, Verrill, distribution; STUDER (256) pp. 144 & 164. †*A. schulzii*, Cretaceous, Silesia; LANGENHAN & GRUNDEY (147) p. 8. *A. studeri*, Bell, distribution; STUDER (256) pp. 148, 149, & 164. *A. sulcifera*, Val., colour; STUDER (256) pp. 281 & 289. *A. tenuispina*, Lam.; EFISIO (73) p. 252. *A. torquata*, Sladen, variant measurements; MEISSNER (179) p. 184. *A. vulgaris*, Stimpson, use for manure, eats oysters ?, poisonous, warningly coloured ?, monstrosities, regeneration, perhaps a syn. of *A. rubens*; GANONG (91) p. 49: eye described; WATASE (269) p. 324.

Asterina, Nardo; AGASSIZ (3) p. 77, BELL (16) p. 82. *A. cepheus*, Val.; MEISSNER (179) p. 187, STUDER (256) pp. 233 & 235: specimens from Amboyna, Mauritius, and Red Sea compared; LORIOL (154) p. 383. *A. chilensis*, Lütk.; MEISSNER (179) p. 187. *A. exigua*, Lam.; LORIOL (154) p. 384. *A. fimbriata*, Perr.; STUDER (256) p. 281. *A. gibbosa*, Penn.; BELL (16) p. 82: commensal Infusorian; CUÉNOT (60): development; MACBRIDE (161): see also under *Asteriscus verruculatus*. *A. marginata* (Val.), Perrier, referred to *A. stellifer*; BELL (18) p. 25. *A. pectinifera*, M. & T., *A. penicillaris*, Lm., MEISSNER (179) p. 187. *A. stellifer*, Möb., synonymy; BELL (18) p. 26.

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Asteriscus verruculatus, M. Tr., young four-rayed ; MARTENS (172).

Asterodon, syn. of *Odontaster*, q.v. *A. pedicillaris*, Perrier (pars), syn. of *Odontaster grayi*, q.v.

Asteropsis capreensis, Gasco, referred to *Marginaster*; MARENZELLER (166) p. 66.

Astrogonium, AGASSIZ (3) p. 77. *A. granulare*, Müll. ; *A. phrygianum*, Parel.; NORDGAARD (201) pp. 5 & 10. *A. meridionale*, *A. miliare*, *A. paxillosum* : see *Odontaster*.

Astronyx loveni ; SMITH (251).

Astropecten, Schultze ; AGASSIZ (3) pp. 79 & 80, BELL (16) p. 66. *A. andromeda*, M. & T. ; NORDGAARD (201) p. 9, PETERSEN (216) p. 44. *A. aurantiacus*, M. & T. ; EFISIO (73) p. 252 : alimentary canal ; FRENZEL (88) p. 105 : colour ; HEIM (114). *A. bispinosus* (Otto), photographed alive ; KOCH (141). †*A.*, *cf. bispinosus*, var., Pliocene, middle Astian of Bra, Piedmont ; SACCO (233) p. 740. *A. capensis*, Stud., colour ; STUDER (256) p. 53. †*A. claviformis*, Wright, p. 198, †*A. hastingiæ*, Forbes, p. 33; FOX-STRANGWAYS (87) II. *A. irregularis*, Penn.; BELL (16) p. 66 : (?) young ; STUDER (256) p. 28. †*A. leckenbyi*, Wright ; FOX-STRANGWAYS (87) II, p. 146. *A. mesactus*, Slad.; STUDER (256) p. 292. *A. muelleri*, M. & T.; NORDGAARD (201) p. 9, PETERSEN (216) p. 44. †*A. orion*, Forbes; FOX-STRANGWAYS (87) II, p. 198. *A. pentacanthus*, Dell. Ch.; STUDER (256) p. 15 : spermatogenesis ; FIELD (83). *A. platyacanthus*, alimentary canal ; FRENZEL (88) p. 104. *A. polyacanthus*, M. & T.; LORIOL (154) p. 379. †*A. rectus*, M'Coy, p. 198, †*A. scarburgensis*, Wright, p. 146 ; FOX-STRANGWAYS (87) II. *A. scoparius*, M. & T., MEISSNER (179) p. 188. *A.* sp., Andaman Sea, 250 fms.; ALCOCK (6) p. 87: Tertiary, N. Italy, †SACCO (233) p. 742. *A. sphenoplax*, Bell ; BELL (16) p. 68. *A. subinermis*, Phil.; STUDER (256) p. 28. †*A. suprajurensis*, Schill. ; SMITH (250) p. 346. *A. variabilis*, Lütk. ; FIELD (82) p. 84. *A. velitaris*, v. Martens, colour ; STUDER (256) pp. 192 & 194. †*A. verrucosus*, Heller; TOULA (265) p. 292.

A. latispinosus, Inland Sea, Japan, MEISSNER, Arch. Naturg. lviii (i), p. 188 ; †*A. taurolaevis*, based on *A. laevis*, Meneghini, *non* Desm., Helvetian of Italy, SACCO, Atti Ac. Torino, xxviii, p. 745 : n. spp.

Astrophyton sp. ; FIELD (82) p. 84.

Bathybiaster, Dan. & Kor., and *B. vexillifer*, W. Thoms. ; BELL (16) pp. 69 & 70.

Brisinga, Asbj. ; AGASSIZ (3) p. 79, BELL (16) p. 104. *B. andamanica*, Alcock & W.-M., redescribed; ALCOCK (6) p. 118. *B. coronata*, G. O. Sars ; BELL (16) p. 105, STEINDACHNER (254) p. 445. *B. bengalensis*, Alcock & W.-M., redescribed ; ALCOCK (6) p. 119. *B. endecacnemos*, Asbj. ; BELL (16) p. 104. *B. insularum*, Alcock & W.-M., redescribed ; ALCOCK (6) p. 117. *B. mediterranea*, Perrier, syn. of *B. coronata* ; STEINDACHNER (254) p. 445.

B. gunni, off Konkan Coast, 559 fms., ALCOCK, Ann. Nat. Hist. (6) xi, p. 120, n. sp.

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Calliaster mamillifera, Andaman Sea, about 250 fms., ALCOCK, J. Asiat. Soc. Bengal, lxii, p. 172, n. sp.

Calliderma grayi, see *Odontaster*.

Chaetaster longipes, Retz.; STUDER (256) p. 28: spermatogenesis; FIELD (83). *C. nodosus*, Perr., colour; STUDER (256) p. 17. *C.* sp., Andaman Sea; ALCOCK (6) p. 101.

Cheilaster, [apparently a new generic name] and *C. fimbriatus*, Slad.; BELL (16) p. 81.

Cheiraster gazellæ, Stud., colour; STUDER (256) p. 197.

Corethraster, W. Thoms., and *C. hispidus*, W. Thoms.; BELL (16) p. 92.

Cribrella; AGASSIZ (3) p. 79. *C. antillarum*, Perr.; STUDER (256) p. 289. *C. oculata*, Linck, oögenesis; FIELD (83). *C. praestans*, Sladen, with variation in arms; ALCOCK (6) p. 112. *C. sanguinolenta*, Müll.; NORDGAARD (201) pp. 5 & 9, PETERSEN (216) p. 43: blood-vascular system; CHADWICK (30): eye described; WATASE (269) p. 324.

Crossaster papposus, Fabr. sp.; GANONG (91) p. 56.

Ctenodiscus, M. & T.; BELL (16) p. 64. *C. australis*, Lütk.; STUDER (256) pp. 287 & 289. *C. crispatus*, Retz.; BELL (16) p. 64, NORDGAARD (201) pp. 5 & 10.

Culcita grex, M. & T., description; LORIOL (154) p. 382.

†*Cupulaster pauper*, ascribed to Frič, but probably intended as n. sp., Cretaceous, Gastropod-bed 3, Priesen, Bohemia; FRIČ, Arch. Landesdf. Bohmen, ix, No. 1, p. 112.

Cycethra simplex, Bell; STUDER (256) p. 289.

Dictyaster, redefined, and *D. xenophilus*, Alcock & W.-M., redescribed; ALCOCK (6) p. 113.

Dipsacaster, n. g., no diagnosis, type *D. pentagonalis*, n. sp., Andaman Sea, 112 fms.; ALCOCK, J. Asiat. Soc. Bengal, lxii, p. 172: diagnosis and *D. sladeni*, n. sp., Andaman Sea, 250 fms.; ALCOCK, Ann. Nat. Hist. (6) xi, p. 87.

Dorigona moebii, Stud.; STUDER (256) p. 197.

D. pentaphylla, Andaman Sea, 271 fms., ALCOCK, Ann. Nat. Hist. (6) xi, p. 93, n. sp.

Dytaster anacanthus, Alcock & W.-M., redescribed, *D. exilis*, Sladen; ALCOCK (6) p. 80.

Echinaster doriæ, De Filippi, redescribed and distinguished from *Asterias tenuispina*; MARCHISIO (162). *E. eridanella*, Val., 6 arms and 2 madreporites; LORIOL (154) p. 391. *E. purpureus*, Gray, with 6 arms; MARTENS (171) p. 183. *E. sepositus*, Lam.; MEISSNER (179) p. 184: spermatogenesis; FIELD (83). *E. spinosus*; FIELD (82) p. 84. *E. spinulifer*, Smith, distribution; STUDER (256) pp. 144 & 164. *E. tribulus*, De Filippi, redescribed and distinguished from *Asterias tenuispina*; MARCHISIO (162).

E. cylindricus, Callao, Peru, MEISSNER, Arch. Naturg. lviii (i) p. 184, n. sp.

Freyella; AGASSIZ (3) p. 77. *F. benthophila*, Sladen, *F. tuberculata*, Sladen: ALCOCK (6) p. 121.

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Fromia monilis, Val.; STUDER (256) p. 233.

Gnathaster, syn. of *Odontaster*, q.v. *G. meridionalis*, Smith, distribution; STUDER (256) p. 164. *G. pilulatus*, syn. of *Odontaster meridionalis*, q.v.

G. mediterraneus, W. of Milo, 834 m., MARENZELLER, SB. Ak. Wien, cii, Abth. 1, p. 68, also in STEINDACHNER (254) p. 445, n. sp.

†*Goniaster bowerbanki*, Forbes, see *Metopaster*. *G. equestris*, Agass., see *G. phrygianus* and *Astrogonium phrygianum*. †*G. hunteri*, Forbes, see *Mitraster*. †*G. mammillata*, Gabb; CLARK (36) p. 32. †*G. mantelli* and *G. parkinsoni*, Forbes, see *Metopaster*. *G. phrygianus*, Parel.; PETERSEN (216) p. 44: variation in length of rays; SCOTT (238) p. 49. †*G. rectilineus*, M'Coy, referred to *Metopaster parkinsoni*; SLADEN (248) p. 32. †*G. rugatus*, Forbes, see *Mitraster*. †*G. scrobiculatus*, Heller; TOULA (265) p. 292. †*G* (?) sp., Tunis; PERON in LORIOL (153) p. 392. †*G. sublunatus* and *G. uncatus*, Forbes, see *Metopaster*. *G. verrucosus*, Gray; STUDER (256) p. 52.

Goniodiscus articulatus, Lütk. *ex* Linn., synonymy; BELL (18) p. 27. "*G. gracilis*, Gray," a phantom species; *loc. cit.* *G. singularis*, M. Tr., see *Odontaster*.

G. sanderi, n. sp., Zanzibar, four-rayed abnormality; MEISSNER, Arch. Naturg. lviii (1) p. 185.

Gymnasterias valvulata, Perr., distribution; BELL (18) p. 28.

Gymnobrisinga sarsi, Stud.; STUDER (256) p. 149.

Heliaster helianthus, Lam.; MEISSNER (179) p. 184.

Henricia, Gray, *H. sanguinolenta*, O. F. Müll., with vars. *abyssicola* and *curta*, Norm.; BELL (16) pp. 95 & 97.

Hippasteria phrygiana, Parel. sp.; GANONG (91) p. 56. *H. plana*, Linck.; SCOTT (240) p. 82.

Hippasterias, Gray, and *H. phrygiana*, Parel.; BELL (16) p. 76.

Hymenaster, W. Thoms.; AGASSIZ (3) p. 77, BELL (16) p. 94. *H. giganteus*, Slad.; BELL (16) p. 95. *H. nobilis*, W. Thoms.; ALCOCK (6) p. 112. *H. pellucidus*, W. Thoms.; BELL (16) p. 94.

Hyphalaster tara, Alcock & W.-M.; ALCOCK (6) p. 86.

Labidiaster radiosus, Lütk.; STUDER (256) p. 286.

Lasiaster and *L. villosus*, Slad.; BELL (16) p. 81.

Leptoptychaster, Smith, and *L. arcticus*, M. Sars; BELL (16) p. 65. *L. kerguelensis*, Smith, distribution; STUDER (256) pp. 140, 149, & 164.

Linckia bouvieri, Perr., colour; STUDER (256) pp. 17 & 22. *L. lævigata*, brilliant colours; KENT (135) p. 43, chromo plate xi. *L. miliaris*, Martens; LORIOL (154) p. 385, STUDER (256) pp. 233, 235, & 260. *L. multiforis*, Lam., with commensal snail; MARTENS (171) p. 183: two madreporites, Cape Town; MEISSNER (179) p. 185. *L.* sp., protective colour, autotomy and regeneration; FIELD (82) p. 84. *L. typus*, see *L. miliaris*.

Luidia, Forbes; BELL (16) p. 70. *L. bellonæ*, Lütk.; MEISSNER (179) p. 189. *L. clathrata* ?; FIELD (82) p. 84. *L. ciliaris*, Johnst.; BELL (16) p. 70. *L. limbata*, Sladen: MEISSNER (179) p. 189. *L.*

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maculata, M. & T., with nine unequal arms; LORIOL (154) p. 380. †*L. murchisoni*, Williams, see *Solaster murchisoni*. *L. sarsi*, Düb. & Kor.; BELL (16) p. 72, PETERSEN (216) p. 44. *L. savignyi*, Aud., Moray Firth; SCOTT (240) p. 82. *L. senegalensis*; FIELD (82) p. 84.

L. paucispina, W. of Candia, 755 m., S.E. of Cape Malea, 1292 m., MARENZELLER, SB. Ak. Wien, cii, Abth. i, p. 66, also in STEINDACHNER (254) p. 445, n. sp.

Luidiaster hirsutus, Stud., distribution; STUDER (256) pp. 146 & 164.

Marginaster capreensis, Gasco sp., vide sub. *Asteropsis*.

Marsipaster hirsutus, Sladen; ALCOCK, Ann. Nat. Hist. (6) xi, p. 112.

Mediaster roseus, Laccadive Sea, 750 fms., ALCOCK, Ann. Nat. Hist. (6) xi, p. 98, n. sp.

†*Metopaster*, n. g., type *Goniaster parkinsoni*, Forbes, p. 31; *M. parkinsoni*, Forbes sp., rediagnosed and described, pedicellariæ on terminals, variations, p. 31; *M. bowerbanki*, Forbes sp., rediagnosed and described, p. 42; *M. mantelli*, Forbes sp., rediagnosed and described, p. 38; *M. sublunatus*, Forbes sp., discussed and doubted, p. 51; *M. uncatus*, Forbes sp., rediagnosed and described, p. 47; SLADEN (248).

M. cingulatus, Upper Chalk, Bromley, Kent, p. 53, *M. cornutus*, based on a figure, locality and horizon unknown, p. 55, *M. zonatus*, Upper Chalk, Bromley, Kent, p. 45, SLADEN, Pal. Soc. Mon. 1893, ii, n. spp.

Metrodira subulata, Gray, colour; STUDER (256) p. 195.

Mimaster and *M. tizardi*, Slad.; BELL (16) p. 78.

Milteliphaster, n. g., and *M. wood-masoni*, n. sp., Andaman Sea, 230–290 fms.; ALCOCK, Ann. Nat. Hist. (6) xi, p. 91.

†*Mitraster*, n. g., type *Goniaster hunteri*, Forbes, which is rediagnosed and described, variation, p. 57; *M. rugatus*, Forbes sp., rediagnosed and described, p. 63; SLADEN, Pal. Soc. Mon. 1893, ii.

Nardoa tuberculata, Gray; LORIOL (154) p. 386.

Neomorphaster and *N. eustichus*, Slad.; BELL (16) p. 87.

Nepanthia brevis, Perr., colour; STUDER (256) p. 194.

Nymphaster, Slad.; BELL (16) p. 75. *N. basilicus*, Sladen, *N. protentus*, Sladen; ALCOCK, Ann. Nat. Hist. (6) xii, p. 95. *N. subspinosus*, Perr.; BELL (16) p. 75.

N. florifer, 130-250 fms., with young stages, p. 94, *N. nora*, 490 fms., p. 96, Andaman Sea, ALCOCK, Ann. Nat. Hist. (6) xi, n. spp.

Odinia, Perr., and *O. pandina*, Slad.; BELL (16) p. 105.

Odontaster, revised, with spp. *O. belli*, *O. dilatatus*, *O. elongatus*, *O. granulosus*, *O. grayi*, *O. hispidus*, *O. meridionalis*, *O. miliaris*, *O. paxillosus*, *O pedicellaris*, *O. singularis*; BELL, P. Zool. Soc. London, 1893, p. 259.

Ophidiaster fuscus, Gray, colour; STUDER (256) p. 195. *O. purpureus*, Perr., Amboyna; LORIOL (154) p. 385.

Oreaster nodosus, see *Pentaceros turritus*. *O. reticulata*, Lütk.; FIELD (82) p. 84.

†*Palasterina ramseyensis*, Hicks; BOLTON (23) p. 105.

Palmipes, Agass.; BELL (16) p. 83. *P. membranaceus*, Retz., 50 fms., Moray Firth; SCOTT (240) p. 82. *P. placenta*, Penn.; BELL (16) p. 84.

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P. pellucidus, Andaman Sea, 112 fms., ALCOCK, Ann. Nat. Hist. (6) xi, p. 100, n. sp.

Paragonaster sp., B. of Bengal ; *op. cit.* p. 98.

P. tenuiradiis, B. of Bengal, 1748 fms., *op. cit.* p. 97, n. sp.

Pararchaster semisquamatus, Sladen ; *op. cit.* p. 75.

P. hudlestonii, B. of Bengal, 1520 fms., p. 76, *P. violaceus*, Laccadive Sea, 1200 fms., p. 77, *op. cit.*, n. spp.

Pedicellaster scaber, Smith, distribution ; STUDER (256) p. 164.

P. atratus, Andaman Sea, 240 fms., and B. of Bengal, 290 fms., ALCOCK, Ann. Nat. Hist. (6) xi, p. 114, n. sp.

Pentaceros clavatus, M. & T., synonymy ; BELL (18) p. 27. *P. dorsatus*, Perr. ; STUDER (256) p. 22. *P. hiulcus*, Gray ; STUDER (256) p. 248. *P. muricatus*, Gray ; MEISSNER (179) p. 187. *P. orientalis*, M. & T. ; STUDER (256) p. 256. *P. turritus*, Linck, variation in colour, and rays ; STUDER (256) p. 254 : variations in surface characters not sexual ; LORIOL (154) p. 380.

Pentaceropsis obtusatus, M. & T., with four arms, variations in spines ; LORIOL (154) p. 381.

Pentagonaster, Schultze ; BELL (16) p. 73. *P. arcuatus*, Sladen ; ALCOCK (6) p. 89. *P. bellii*, Stud.; STUDER (256) p. 285 ; see also *Odontaster*. *P. dilatatus*, see *Odontaster*. *P. granularis*, Retz.; BELL (16) p. 73. *P. greeni*, Bell. ; BELL (16) p. 74. *P. intermedius*, Perrier ; ALCOCK (6) p. 90. †*P. megaloplax*, Slad., description continued ; SLADEN (248) p. 29. *P. meridionalis*, Smith ; STUDER (256) p. 144. *P. paxillosus*, Bell *non* Gray, syn. of *Odontaster grayi*, q.v. *P. spinulosus*, Gray; STUDER (256) p. 216. *P. squamulosus*, Stud.; STUDER (256) p. 184. *P. tuberculatus*, Gray, colour ; STUDER (256) p. 55.

P. hystricis, N. of Benghazi, 680 m., N. of Candia, 943 m., S. of Cerigo, 620 m., MARENZELLER, SB. Ak. Wien, cii, Abth. i, p. 67: also in STEINDACHNER (254) p. 445 ; *P. investigatoris*, B. of Bengal, off Kistna Delta, 678 fms., p. 88, *P. pulvinus*, Laccadive Sea, off Mimni Koy, 1200 fms., p. 90, ALCOCK, Ann. Nat. Hist. (6) xi : n. spp.

Persephonaster, redefined, with *P. cœlochiles*, Andaman Sea, 230 fms., ALCOCK, Ann. Nat. Hist. (6) xi, p. 84, n. sp.

P. croceus, Alcock & W.-M., redescribed ; ALCOCK (6) p. 82. *P. rhodopeplus*, Alcock & W.-M., redescribed ; *op. cit.* p. 83.

†*Plumaster ophiuroides*, Wright; FOX-STRANGWAYS (87) II, p. 34, WOODWARD (276) p. 370.

Plutonaster, Slad., and *P. bifrons*, W. Thoms ; BELL (16) p. 62, STEINDACHNER (254) p. 445. *P. pareli*, Düb. & Kor.; BELL (16) p. 63.

Pontaster, Slad. ; BELL (16) p. 60. *P. hispidus*, Alcock & W.-M.; ALCOCK (6) p. 79. *P. mimicus*, Sladen ; ALCOCK (6) p. 78. *P. tenuispinis*, Düb. & Kor sp., redescribed and held to include *P. hebitus*, *P. limbatus*, and var. *platynota* of Sladen ; BELL (15) & (16) p. 60.

P. cribellum, Laccadive Sea, 1200 fms., p. 78, *P. pilosus*, G. of Manaar, 597 fms., p. 79, ALCOCK, Ann. Nat. Hist. (6) xi, n. spp.

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Porania, Gray; BELL (16) p. 79. *P. antarctica*, Smith, distribution; STUDER (256) pp. 140 & 164. *P. magellanica*, Stud.; STUDER (256) p. 281. *P. pulvillus*, O. F. Müll.; BELL (16) p. 79.

Porcellanaster caeruleus, W. Thomson; ALCOCK (6) p. 86.

Pseudarchaster mosaicus, Alcock & Mason, large specimen, Madras coast; ALCOCK (5) p. 171, and (6) p. 85.

Psilaster, Slad.; BELL (16) p. 68. *P. acuminatus*, Slad.; STUDER (256) p. 266. *P. andromeda*, M. & T.; BELL (16) p. 69.

Pteraster, M. & T.; BELL (16) p. 93. *P. affinis*, Smith, distribution; STUDER (256) p. 164. *P. miliaris*, O. F. M. sp.; GANONG (91) p. 56, *P. militaris*, O. F. Müll., with var. *prolata*, Slad.; BELL (16) p. 93. NORDGAARD (201) pp. 6, 9. *P. personatus*, Slad.; BELL (16) p. 94. *P. rugatus*, Slad., distribution; STUDER (256) p. 164.

Retaster peregrinator, Slad., distribution; STUDER (256) p. 164.

Rhegaster and *R. murrayi*, Slad.; BELL (16) p. 80.

†*Stellaster coombii*, Forbes; FRIČ (89) p. 113.

Solaster, Forbes, and *S. endeca*, Linn.; BELL (16) pp. 88 & 90, NORDGAARD (201) pp. 5, 10, PETERSEN (216) p. 43: poisonous; GANONG (91) p. 56. *S. furcifer*, Düb. & Kor.; BELL (16) p. 91, NORDGAARD (201) p. 10. †*S. murchisoni*, Williams sp.; FOX-STRANGWAYS (87) II, p. 34, WOODWARD (276) p. 370. *S. papposus*, Fabr.; BELL (16) p. 89, GARSTANG (92) p. 335, PETERSEN (216) p. 43: var. *septentrionalis*, Slad.; BELL (16) p. 90.

†*Sphaeraster punctatus*, Quenst.; SIEMIRADZKI (244) p. 142.

Stichaster, M. & T.; BELL (16) p. 85. *S. aurantiacus*, Mey.; MEISSNER (179) p. 184. *P. roseus*, O. F. Müll.; BELL (16) p. 85, NORDGAARD (201) p. 9.

Styracaster armatus, Sladen; *S. clavipes*, Alcock & W.-M.; *S. horridus*, Sladen; ALCOCK (6) p. 86.

†*Tropidaster pectinatus*, Forbes; FOX-STRANGWAYS (87) II, p. 34, WOODWARD (276) p. 370.

†*Uraster carinatus*, Wright; FOX-STRANGWAYS (87) II, p. 34. †*U. gaveyi*, Forbes; WOODWARD (276) p. 370. *U. glacialis*, see *Asterias*.

Zoroaster, W. Thoms.; BELL (16) p. 87. *Z. fulgens*, W. Thoms.; *op. cit.* p. 88.

Z. alfredi, Bay of Bengal, 599 and 1300 fms., Ann. Nat. Hist. (6) xi, p. 102, and (5) p. 173; *Z. angulatus*, Gulf of Manaar, 597 fms., and Laccadive Sea, 705 fms., with young stage, p. 105, *Z. barathri*, Bay of Bengal, 599 and 1520 fms., *op. cit.* (6) xi, p. 103, and *op. cit.* (5) p. 173, *Z. carinatus*, Andaman Sea, 130–250 fms., with young stage, p. 107, *Z. gilesi*, Andaman Sea, 500 fms., p. 108, *Z. planus*, Laccadive Sea, 1200 fms., p. 104, *Z. squameus*, Laccadive Sea, 1043 fms., p. 109, *Z. sæx*, Laccadive Sea, 1200 fms., and Gulf of Manaar, 597 fms., p. 110, *op. cit.* (6) xi; ALCOCK: n. spp.

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(E.)—OPHIUROIDEA.

Classification of the Class ; PERRIER (213) pp. 854–857.

†*Acroura* : the generic validity discussed ; NEVIANI (200) p. 217. *A. brodiei*, Wright ; WOODWARD (276) p. 370. *A. granulata*, see under *Ophiura*.

Amphilepis norwegica, Ljungm., distribution ; GRIEG (106) p. 16.

Amphiura, Forbes, described ; BELL (16) p. 117, FJELSTRUP (84) p. 26. *A. bellis*, var. *tritonis*, Hoyle ; BELL (16) p. 121. *A. borealis*, G. O. Sars ; BELL (16) p. 121 : distribution; GRIEG (106) p. 15. *A. chiajei*, Forbes; BELL (16) p. 117, FJELSTRUP (84) p. 27, PETERSEN (216) p. 46 : distribution ; GRIEG (106) p. 11. *A. congensis*, Stud , colour; STUDER (256) pp. 22 & 30. *A. duncani*, Lym., described ; LORIOL (154) p. 404. *A. elegans*, Leach ; BELL (16) p. 119, GARSTANG (92) p. 335, PETERSEN (216) p. 46 : distribution, GRIEG (106) p. 13. *A. eugeniæ*, Ljungm ; STUDER (256) p. 287. *A. filiformis*, O. F. Müll.; BELL (16) p. 119, FJELSTRUP (84) p. 27, PETERSEN (216) p. 45 : distribution ; GRIEG (106) p. 12. *A. modesta*, Stud., colour ; STUDER (256) p. 269. *A. securigera*, Düb. & Kor.; BELL (16) p. 120. *A.* sp. ; FIELD (82) p. 84. *A. squamata*, Della Chiaje; FJELSTRUP (84) p. 26 : development; MACBRIDE (159), CUENOT (59), RUSSO (230). *A. studeri*, Lym., distribution ; STUDER (256) pp. 144, 145, & 164. *A. sundevalli*, M. & T., Greenland ; GRIEG (105) p. 9. *A. tomentosa*, Lym., distribution; STUDER (256) p. 164.

†*Aspidura ludeni*, Hag.; GEINITZ (96) p. 190.

Astronyx and *A. loveni*, M. & T.; BELL (16) p. 136 : genital fissures, stomach, distribution; GRIEG (106) p. 29.

Astroschema flosculus, Coral bank N. of Madras, 88 fms., ALCOCK, J. Asiat. Soc. Bengal, lxii, p. 173, n. sp.

Euryale aspera, Lam., colour ; STUDER (256) p. 195.

Gorgonocephalus, Lym. ; BELL (16) p. 137. *G. agassizi*, Stimps., Labrador, development of apical system ; GRIEG (105) p. 10 : growth, changes, distribution ; GRIEG (106) p. 35. *G. eucnemis*, M. & T. ; BELL (16) p. 138 : includes *G. malmgreni*, distribution ; GRIEG (106) p. 32. *G. lamarcki*, M. & Tr. sp., distribution ; GRIEG (106) p. 31. *G. lincki*, M. & T.; BELL (16) p. 137 : development of apical system; GRIEG (105) p. 11. *G. malmgreni*, Dan. & Kor., a variety of *G. eucnemis*, q.v. *G. pourtalesi*, Lym., distribution ; STUDER (256) pp. 149 & 164.

Ophiacantha, M. & T. ; BELL (16) p. 127. *O. abyssicola*, G. O. Sars ; BELL (16) p. 128, NORDGAARD (201) p. 5 : variations of spines, distribution ; GRIEG (106) p. 24. *O. bidentata*, Retz.; BELL (16) p. 127 : distribution, Greenland and Labrador ; GRIEG (105) p. 10, and (106) p. 22. *O. fraterna*, Verrill, a variety of *O. bidentata* ; GRIEG (106) p. 22. *O. imago*, Lym., distribution ; STUDER (256) p. 164. *O. spectabilis*, G. O. Sars ; BELL (16) p. 128 : distribution ; GRIEG (106) p. 24. *O. stimulea*, Lym. : STUDER (256) p. 273. *O.*

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vivipara, Ljungm., distribution; STUDER (256) pp. 144, 149, 163, 283, & 288.

Ophiactis, Lütk., and *O. abyssicola*, M. Sars; BELL (16) pp. 122 & 123: distribution; GRIEG (106) p. 16. *O. asperula*, Lütk.; STUDER (256) pp. 281, 283, & 285. *O. balli*, Thomps.; BELL (16) p. 123. *O. flexuosa*, Lym., colour; STUDER (256) p. 55. *O. incisa*, Martens, colour of seaweed on which it lives; STUDER (256) p. 248. *O. krebsi*, Lütk.; STUDER (256) p. 22. *O. sexradia*, Grube; STUDER (256) p. 192: detailed description, distinguished from *O. savigny* and others; LORIOL (154) p. 398.

O. brocki, Amboyna, DE LORIOL, Rev. Suisse Zool. i, p. 401, n. sp.

Ophiarachna affinis, Luetk., described and extended to *O. clavigera*, Brock; LORIOL (154) p. 411.

Ophiarthrum elegans, Peters; LORIOL (154) p. 413, STUDER (256) p. 235.

Ophiobyrsa and *O. hystricis*, Lym.; BELL (16) p. 135.

Ophiocantha; AGASSIZ (3) p. 80.

Ophiochiton, Lym.; BELL (16) p. 114. *O. lymani*, Stud.; STUDER (256) pp. 175 & 182. *O. ternispinis*, Lym.; BELL (16) p. 114.

Ophocnida, Lym., and *O. brachiata*, Mont.; BELL (16) p. 116. *O. pilosa*, Lym.; STUDER (256) p. 192.

O. picteti, Amboyna, DE LORIOL, Rev. Suisse Zool. i, p. 405, n. sp.

Ophiocoma, Agass., described; BELL (16) p. 128, FJELSTRUP (84) p. 29. *O. aethiops*; FIELD (82) p. 84. *O. erinaceus*, M. & T.; STUDER (256) pp. 216, 235, & 256: variations in measurements and surface characters; LORIOL (154) p. 410. *O. nigra*, Abilg.; BELL (16) p. 129, FJELSTRUP (84) p. 29, GARSTANG (92) p. 335, PETERSEN (216) p. 47. *O. pica*, M. & Tr.; STUDER (256) p. 216. *O. pumila*, Lütk.; STUDER (256) p. 22. *O. scolopendrina*, Lam.; STUDER (256) pp. 235 & 248: var. *alternans*, Martens, described; LORIOL (154) p. 407. *O.* sp.: alimentary canal; FRENZEL (88) p. 110.

Ophioconis antarctica, Lym., distribution; STUDER (256) p. 164.

Ophiocreas, AGASSIZ (3) pp. 78 & 82. *O. adhaerens*, Stud., colour; STUDER (256) p. 184.

Ophiocten, Lütk.; BELL (16) p. 113. *O. amitinum*, Lym., distribution, colour; STUDER (256) pp. 164, 283, & 288. *O. sericeum*, Forbes; BELL (16) p. 113: Greenland; GRIEG (105) p. 8: includes *Ophioglypha gracilis*, Sars, distribution; GRIEG (106) p. 9.

Ophiocymbium cavernosum, Lym., bursæ discussed; MORTENSEN (197) p. 508.

Ophioderma antillarum; FIELD (82) p. 84. †*O.* ? *bridgerensis*, Meek, see *Ophioglypha bridgerensis*. †*O. carinata*, Wright; FOX-STRANGWAYS (87) II, p. 33. †*O. egertoni*, Brod.; WOODWARD (276) p. 370. †*O. gaveyi*, Wright; WOODWARD (276) p. 370, and FOX-STRANGWAYS (87) II, p. 33. *O. longicauda*, M. & T.; EFISIO (73) p. 252: alimentary canal; FRENZEL (88) p. 110. †*O. milleri*, Phill. sp.; FOX-STRANGWAYS (87) II, p. 33, WOODWARD (276) p. 370. *O. tenuibrachiata*, Forbes; WOODWARD (276) p. 370.

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Ophiogona lærigata, Stud., colour, distribution ; STUDER (256) pp. 146 & 163.

Ophioglypha, described ; FJELSTRUP (84) p. 22. *O. affinis*, Lütk. sp. ; FJELSTRUP (84) p. 24, PETERSEN (216) p. 45 : colour-variation, distribution; GRIEG (106) p. 7. *O. albida*, Forbes ; FJELSTRUP (84) p. 23, PETERSEN (216) p. 45, NORDGAARD (201) p. 6: alimentary canal: FRENZEL (88) pp. 90 & 108 : in Eastern Baltic ; KOJEVNIKOV (143) p. 141. *O. brevispina*, Smith, distribution ; STUDER (256) pp. 140 & 163. †*O. bridgerensis*, Meek sp., redescribed ; CLARK (36) p. 29. *O. carnea*, Lütk. sp., distribution; GRIEG (106) p. 6 : E. Mediterranean ; MARENZELLER (165) p. 66, also in STEINDACHNER (254) p. 445. *O. carinata*, Stud., colour, distribution; STUDER (256) pp. 146, 147, 149, & 163. *O. ciliaris*, Hoffm., considered a var. of *O. sarsi* ; GRIEG (105) p. 5. *O. ciliata*, Retz.; FJELSTRUP (84) p. 22, NORDGAARD (201) p. 6. *O. costata*, Lym., colour ; STUDER (256) p. 53. *O. deshayesi*, Lym., distribution ; STUDER (256) p. 163. *O. gracilis*, G. O. Sars, perhaps young of *Ophiocten sericeum*, q.v.; GRIEG (105) p. 9. †*O. granulata*, Benecke sp., redescribed and figured ; NEVIANI (200) p. 215, see also under *Ophiura*. *O. hexactis*, Smith, brood-pouches, distribution; STUDER (256) pp. 143, 145 & 163. *O. lacertosa*, spermatogenesis ; FIELD (83): photographed alive ; KOCH (141). *O. nodosa*, Lütk., Greenland, variations in and development of apical system; GRIEG (105) p. 6. *O. robusta*, Ayres ; FJELSTRUP (84) p. 24, PETERSEN (216) p. 45 : Greenland, GRIEG (105) p. 6 : distribution ; GRIEG (106) p. 6. *O. sarsi*, Lütk., FJELSTRUP (84) p. 23, PETERSEN (216) p. 45 : Greenland, GRIEG (105) p. 5 : distribution, GRIEG (106) p. 4. *O.* sp., swimming described ; SLUITER (249) p. 181. *O. stellata*, Stud., colour ; STUDER (256) pp. 192 & 194. *O. texturata*, Lam.; PETERSEN (216) p. 44 : alimentary canal ; FRENZEL (88) p. 109. *O. verrucosa*, Stud., distribution ; STUDER (256) pp. 149 & 163.

†*O.*? *pulcherrima*, ascribed to Frič, but probably intended as n. sp., Cretaceous, Priesener Schichten, Waldek, near Bensen, Bohemia ; FRIČ, Arch. Landesdf. Bohmen, ix, No. 1, p. 114. †*O. texana*, Denison Beds of the Washita division of the Comanche series, Lower Cretaceous, 6 miles N. of Fort Worth, CLARK, Bull. U. S. Geol. Surv. No. 97, p. 30 : n. sp.

Ophiogymna elegans, Ljungm.; STUDER (256) p. 256.

Ophiolepis affinis, Stud., protective colour ; STUDER (256) pp. 22 & 28. *O. cincta*, M. & T.; LORIOL (154) p. 398: var. *nigra*, Stud.; STUDER (256) pp. 233 & & 248. †*O. leckenbyi*, Wright ; FOX-STRANGWAYS (87) II, p. 146. †*O. murrayi*, Forbes sp. ; FOX-STRANGWAYS (87) II, pp. 33 & 146. *O. paucispina*, M. & Tr. ; STUDER (256) p. 22. †*O. ramsayi*, Wright ; WOODWARD (276) p. 370.

Ophiomastix annulosa, M. & Tr. ; LORIOL (154) p. 413, STUDER (256) pp. 235, 248, 256, & 260: mode of feeding; KENT (135) p. 121. *O. caryophyllata*, Luetk. ; LORIOL (154) p. 414. *O. flaccida*, Lym. ;

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STUDER (256) p. 233. *O. mixta*, Luetk., with claviform spines; LORIOL (154) p. 414.

Ophiomusium, Lym.; AGASSIZ (3) p. 78, BELL (16) p. 115. *O. flabellum*, Lym., and *O. pulchellum*, Lym., said not to belong to *Ophiomusium*, but no name proposed; MORTENSEN (197) p. 508. *O. lymani*, W. Thoms.; BELL (16) p. 115.

Ophiomyxa, M. & T.; BELL (16) p. 136. *O. brevispina*, Martens, described; LORIOL (154) p. 425: coloured like sponges, among which it lives; STUDER (256) p. 233. *O. flaccida*, Say, colour; STUDER (256) pp. 16 & 22. *O. serpentaria*, Lym.; BELL (16) p. 136. *O. vivipara*, Stud., distribution; STUDER (256) pp. 164 & 287.

Ophionereis reticulata; FIELD (82) p. 84.

†*Ophiopege*, n. g., for *Protaster gregarius*, M. & W., Keokuk Group, Indiana; BOEHM, Zeitschr. geol. Ges. xlv, p. 159.

Ophiopeza fallax, see *Ophiopezella lutkeni*.

Ophiopezella lutkeni, pro *O. fallax*, Luetken, *non* Peters, Amboyna; LORIOL, Rev. Suisse Zool. i, p. 392, n. sp.

Ophiopholis, Lütk.; AGASSIZ (3) p. 80, FJELSTRUP (84) p. 28, BELL (16) p. 125. *O. aculeata*, Linn.; BELL (16) p. 125, FJELSTRUP (84) p. 28, NORDGAARD (201) p. 5, PETERSEN (216) p. 46; Greenland and Labrador, a racial var.; GRIEG (105) p. 9: distribution; GRIEG (106) p. 20.

Ophiopleura borealis, Dan. & Kor., radial shields described, distribution; GRIEG (106) p. 3.

Ophioplocus imbricatus, M. & T.; LORIOL (154) p. 398.

Ophiopsila, Forbes, and *O. annulosa*, Sars; BELL (16) p. 130.

Ophiopus, Ljung.; BELL (16) p. 124: maintained as a genus; MORTENSEN (197) p. 508. *O. arcticus*, Ljung; BELL (16) p. 124: Greenland; GRIEG (105) p. 9: genital bursa, structure and extrusion of ova, distribution; GRIEG (106) p. 17: anatomical description; MORTENSEN (197).

Ophiopyrgus saccharatus, Stud., colour; STUDER (256) p. 273.

Ophioscolex and *O. glacialis*, M. & T.; BELL (16) p. 134: Greenland; GRIEG (105) p. 10: variation in colour and size, distribution; GRIEG (106) p. 27. *O. prolifer*, Stud., colour; STUDER (256) p. 269. *O. purpurea*, Düb. & Kor.; BELL (16) p. 134: distribution; GRIEG (106) p. 28.

Ophiothamnus gracilis, Stud.; STUDER (256) p. 196. *O. remotus*, Lym.; STUDER (256) p. 55. *O. vicarius*, Lym., bursæ discussed; MORTENSEN (197) p. 508.

Ophiothrix, M. & T., described; BELL (16) p. 130, FJELSTRUP (84) p. 25. *O. aristulata*; STUDER (256) p. 54. *O. comata*, M. & T.; LORIOL (154) p. 419. *O. echinata*, M. & T.; RUSSO (231): spermatogenesis; FIELD (83). *O. fragilis*, Abildg.; BELL (16) p. 131, FJELSTRUP (84) p. 25, PETERSEN (216) p. 47, NORDGAARD (201) p. 5, RUSSO (231): spermatogenesis; FIELD (83): distribution; GRIEG (106) p. 25:

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alimentary canal; FRENZEL (88) p. 109: parasitic Infusorian, Trematode, and Polychaet; CUÉNOT (60). *O. galateæ*, Luetk.; LORIOL (154) p. 420. *O. longipeda*, M. & T.; LORIOL (154) p. 415, STUDER (256) p. 278. *O. luetkeni*, W. Thoms.; BELL (16) p. 133. *O. martensi*, Lym.; STUDER (256) p. 216. *O. nereidina*, M. & T.; STUDER (256) p. 192. *O. orsteri* ?, sexual dimorphism of colour; FIELD (82) p. 84. *O. pentaphyllum*; GARSTANG (92) p. 335. *O. petersi*, Stud., sexual distinction of colour; STUDER (256) p. 25. *O. plana*, Lym.; STUDER (256) p. 256. *O. propinqua*, Lym.; LORIOL (154) p. 425. *O. punctolimbata*, Martens; STUDER (256) p. 216: described and figured, also a young form; LORIOL (154) p. 416. *O. purpurea*, Martens; STUDER (256) p. 216. *O. rubra*, Ljungm., colour; STUDER (256) p. 17. *O. smaragdina*, Stud.; STUDER (256) p. 196. †*O.* sp., Pliocene, Parana, Italy; SACCO (233) p. 744. *O. trilineata*, Lütk.; STUDER (256) p. 233. *O. triloba*, Martens; STUDER (256) p. 278.

O. bedoti, Amboyna, p. 420, *O. picteti*, Amboyna, = *O. cf. foveolata*, Brock, p. 423, LORIOL, Rev. Suisse Zool. i: n. spp.

Ophiura, Agass.; BELL (16) p. 106. *O. abyssicola*, Forbes, referred to *Ophiocten*; MARENZELLER (166) p. 66, also in STEINDACHNER (254) p. 445. *O. affinis*, Lütk.; BELL (16) p. 111. *O. albida*, Forbes; BELL (16) p. 108. *O. aurantiaca*, Verr.; BELL (16) p. 122. *O. ciliaris*, Linn.; BELL (16) p. 106. †*O. egertonii*, Brod., var. *angulati*, n. var. & non descript., Lower Lias, Swabia; ENGEL (74) p. li. †*O. granulata*, Benecke; BOEHM (22) p. 158. *O. robusta*, Ayres, and *O. sarsi*, Lütk.; BELL (16) p. 109. *O. signata*, Verr.; BELL (16) p. 110.

†*O. turneri*, Lias β, Göppingen, Swabia [insufficiently described and no figure], ENGEL, Jahresh. Ver. Wurttemb. xlviii, p. lii, n. sp.

†*Ophiurella columba* ?, Blake; FOX-STRANGWAYS (87) II, p. 34. †*O. griesbachi*, Wright; BOEHM (22) p. 158.

Ophiuropsis lymanni, Stud.; STUDER (256) p. 184.

Pectinura gorgonia, M. & T., and *P. infernalis*, M. & T.; LORIOL (154) p. 397. *P. semicincta*, Stud., colour; STUDER (256) pp. 16 & 22.

P. septemspinosa, M. & T., var. with undivided dorsal shields, described and figured; LORIOL (154) p. 395.

†*Protaster gregarius*, M. & W., type of *Ophiopege*, n. g., q.v.; BOEHM, Zeitschr. geol. Ges. xlv.

Sigsbeia; AGASSIZ (3) pp. 78 & 83.

(F.)—CRINOIDEA.

A large number of names, apparently taken from the unpublished Vol. vii, Abth. ii, of Barrande's "Systême Silurien du centre de la Bohême," are quoted in JAHN (127). As these names are at present without meaning, they are not entered here.

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General classification discussed, with reference to *Plicatocrinidæ* and *Saccocoma*; JAEKEL (125) p. 691. General classification and relation to other *Echinoderma*, the name *Pelmatozoa*; AGASSIZ (2) pp. 7–12. Definition discussed; BATHER (11) p. 19.

†*Abacocrinus cappelleri*; BATHER (11) p. 4.

†*Acrochordocrinus amalthei*, Quenst. sp., Eisenoolith, Dsiroula in Imeretien, Caucasus; NEUMAYR & UHLIG (198) p. 3.

†*Actinocrinus clarus*, Hall, now first figured, p. 8; *A. eryx*, Hall, *A. glans*, Hall, now first figured and distinguished from *A. eryx*, p. 10; *A. limabrachiatus*, Hall, now first figured, arms only, p. 5; WHITFIELD (271). *A. lobatus*, Worthen non Hall, see *A. augustatus*. *A. opusculus*, Hall, now first figured, p. 9; *A. quarternarius*, Hall, now first figured, but only doubtfully distinguished from *A. proboscidialis*, p. 7; *A. rusticus*, Hall, now first figured, but referred to *A. scitulus*, M. & W.; *A. scitulus*, M. & W., p. 10; *A. securis*, Hall, p. 6; *A. sexarmatus*, Hall, p. 6; WHITFIELD (271). *A.* sp., Gympie Beds and Star Beds, Queensland; ETHERIDGE (76) p. 207. *A.* sp., Carboniferous, Turkestan, portion of cup; ROMANOVSKII (223) p. 83. *A. thetis*, Hall, now first figured and distinguished from *A. sexarmatus* and *A. securis*; WHITFIELD (271) p. 6.

†*A. arrosus*, Burlington Group, Iowa, p. 15, *A. augustatus* [error for *angustatus*], nom. nov. for *A. lobatus*, Worthen non Hall, Keokuk. Group, Illinois, p. 11, MILLER & GURLEY, Bull.-Ill. Mus. iii; *A. blairi*, p. 35, *A. brittsi*, p. 36, Burlington Group, Sedalia, Mo., *A. chouteauensis*, Chouteau Limestone, Sedalia, Mo., p. 18, MILLER, Pal. Indiana, 1892; *A. erraticus*, Burlington Group, Illinois, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 14; *A. fossatus*, Burlington Group, Sedalia, Mo., MILLER, Pal. Indiana, 1892, p. 40; *A. gibsoni*, Keokuk Group, Indiana, p. 10, *A. plagosus*, Burlington Group, Iowa, p. 16, MILLER & GURLEY, Bull. Ill. Mus. iii; *A. sedaliensis*, Burlington Group, Sedalia, MILLER, Pal. Indiana, 1892, p. 16 ; n. spp.

Actinometra bennetti, J. Müll., held to include *A. peroni*, p. 95; *A. brachiolata*, Lam., p. 107; *A. coppingeri*, Bell, variation in brachials, p. 101; *A. divaricata*, Carp., from Amboina, p. 94; *A. fimbriata*, Lam., variation in brachials and in joints, p. 102; *A. gracilis*, Hartl., redescribed and now first figured, p. 111; *A. macrobrachius*, Hartl., redescribed, p. 101; *A. maculata*, Carp., Mortlock Islands, p. 105; HARTLAUB (113). *A. multiradiata*, Linn. sp., from Amboina, Formosa, and Japan; *op. cit.* p. 103: colour; STUDER (256) pp. 194 & 195. *A. parvicirra*, J. Müll., two varieties distinguished, p. 96; *A. pectinata*, Retz. sp., albino, and arms without ambulacral groove, p. 107; HARTLAUB (113). *A. peroni*, Carp., see *A. bennetti*. *A. pulchella*, Pourt., redescribed and said to be identical with *Comatula echinoptera*, p. 105; *A. regalis*, Carp., variations in arms, p. 99; *A. solaris*, Lam., China Sea, p. 107; *A. stelligera*, Carp., variation in pinnules, p. 104; *A. typica*, Loven sp., variation in arms, p. 108; HARTLAUB (113).

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†*Aesiocrinus angulatus*, Coal Measures, Missouri, Miller & Gurley, Bull. Ill. Mus. iii, p. 59, n. sp.

†*Agaricocrinus* :—*A. americanus*, Roem., p. 26; *A. corrugatus*, Hall, p. 23; *A. excavatus*, Hall, now first figured and distinguished from *A. americanus* and others, p. 26; *A. ornotrema*, Hall, now first figured, p. 24; *A. pentagonus*, Hall, ditto, p. 25; *A. pyramidatus*, Hall, now first figured and distinguished (?) from *A. corrugatus*, p. 23; Whitfield (271).

A. blairi, p. 21, *A. chouteauensis*, p. 43, *A. germanus*, p. 42, Chouteau Limestone, Sedalia, Mo., *A. sampsoni*, Chouteau Limestone, Chouteau Springs, Mo., p. 20; Miller, Pal. Indiana, 1892, n. spp.

†*Allagecrinus*, morphology ; Bather (11) p. 21.

†*Ampheristocrinus*, systematic position ; Bather (11) p. 107.

†*Amphoracrinus* :—*A. divergens*, Hall, type-specimen now first figured, p. 21; *A. inflatus*, Hall, now first figured and distinguished (?) from *A. spinobrachiatus*; *A. spinobrachiatus*, Hall, p. 22; Whitfield (271).

†*Anomalocrinus*, morphology and systematic position ; Bather (11) pp. 20, 35, 41, & 60.

Antedon, de Frem.; Bell (16) p. 52 : evolution ; Bather (10) p. 275, and Hurst (124) p. 199. *A. aculicirra*, Carp., referred to *A. ludovici*; Hartlaub (113) p. 29. *A. æquipinna*, Carp., see *A. imparipinna*. *A. affinis*, Hartl., redescribed and now first figured, p. 25; *A. afra*, Hartl., redescribed and now first figured, p. 87; Hartlaub (113). *A. amboinensis*, Hartl., see *A. brevicuneata*. *A. andersoni*, Carp., redescribed and figured, p. 78; *A. bella*, Hartl., redescribed and now first figured, with var. *brunnea*, n. var., Amboina, p. 43; *A. bengalensis*, Hartl., redescribed and now first figured, p. 19; Hartlaub (113). *A. bifida*, Penn.; Bell (16) p. 54 : development and orientation of stem ; Bather (11) p. 44 : see also under *A. rosacea*. *A. bipartipinna*, Carp., doubtfully referred to *A. ludovici*; Hartlaub (113) p. 29. †*A. breviceps*, Tate ; Tate & Dennant (258) p. 226; *A. brevicuneata*, Carp., redescribed with certain variations from the type-specimen, and held to include *A. amboinensis* and *A. similis*, p. 68; *A. brocki*, Hartl., redescribed and now first figured, p. 23; *A. clarae*, Hartl., ditto, p. 41; *A. conifera*, Hartl., ditto, p. 76; Hartlaub (113). *A. conjungens*, Carp., see *A. imparipinna*. *A. crassipinna*, Hartl., redescribed and now first figured, p. 32; *A. elongata*, J. Müll., redescribed and figured, p. 71; *A. erinacea*, Hartl., redescribed and now first figured, p. 52; Hartlaub (113). *A. eschrichti*, J. Müll.; Bell (16) p. 53 : testes; Danielssen (6) pp. 19 & 23. *A. finschii*, Hartl., redescribed and now first figured; Hartlaub (113) p. 47. †*A. fischeri*, Gein., = *Bourgueticrinus ellipticus*, root figured; Frič (89) p. 109. *A. flagellata*, J. Müll., redescribed and figured, p. 73; *A. hupferi*, Hartl., redescribed and now first figured, p. 88; *A. imparipinna*, Carp., redescribed and figured, and held to include *A. æquipinna*, *A. conjungens*, and *A. protecta*, p. 63; *A. japonica*, Hartl., p. 84, *A. klunzingeri*, Hartl., p. 46, *A. kraepelini*, Hartl., p. 22, all redescribed and

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now first figured; HARTLAUB (113). *A. laevipinna*, Carp., see *A. milberti*. *A. lepida*, Hartl., referred to *A. palmata*; *op. cit.* p. 49. *A. longicirra*, P. H. Carp., variation in length of cirri; BELL (17) p. 339. *A. ludovici*, Carp., a variety from Amboina described and figured; HARTLAUB (113) p. 29. *A. macronema*, Müll., variation in first syzygy; *op. cit.* p. 78: lives attached to sea-weed; STUDER (256) p. 185. *A. martensi*, Hartl., redescribed and figured for the first time, p. 21; *A. milberti*, J. Müll., held to include *A. laevipinna*, p. 81; *A. monacantha*, Hartl., p. 59, *A. nematodon*, Hartl., p. 27, *A. nana*, Hartl., p. 89, *A. oxyacantha*, p. 55, all redescribed and now first figured; *A. palmata*, J. Müll., Red Sea, Singapore, and Tonga Is., redescribed and figured, p. 49; HARTLAUB (113). *A. patula*, P. H. Carp., variation in brachials; BELL (17) p. 341. *A. perspinosa*, Carp., a variety from Amboina; HARTLAUB (113) p. 85. *A. petasus*, Düb. & Kor.; BELL (16) p. 57: testes, ovary; DANIELSSEN (61) pp. 19 & 23. *A. phalangium*, J. Müll.; BELL (16) p. 59, STEINDACHNER (254) p. 445: parasitic *Myzostoma*; PROUHO (220). *A. prolixa*, Slad.; BELL (16) p. 58: testes, ovary; DANIELSSEN (61) pp. 19 & 23. *A. protecta*, Hartl. ex Lütken M. S., see *A. imparipinna*. *A. quadrata*, Carp.; DANIELSSEN (61) p. 23. *A. rosacea*, Auctt.; GARSTANG (92) p. 335, STUDER (256) p. 22, CUÉNOT (58), and Oogenesis (57): abnormal; CHADWICK (31): alimentary canal; FRENZEL (88) p. 110: development and homologies; SEELIGER (241): see also *A. bifida*. *A. serripinna*, Carp., redescribed and figured; HARTLAUB (113) p. 82. *A. similis*, Carp., see *A. brevicuneata*. *A.* sp., great variation in colour; KENT (135) p. 43. *A. spinipinna*, Hartl., redescribed and now first figured; HARTLAUB (113) p. 61. *A. tenella*, Retz.; BELL (16) p. 57, DANIELSSEN (61) p. 23, NORDGAARD (201) pp. 5 & 9. *A. tenera*, Hartl., redescribed from specimens which were not fit to figure, p. 66; *A. tenuipinna*, Hartl., redescribed and now first figured, p. 54; HARTLAUB (113).

A. pyropa, Pyrope Beds of Chodoulic, Bohemia, ZAHALKA (277); *A. wood-masoni*, Sahul Bank, N. Australia, BELL, J. Linn. Soc. xxiv, p. 340 : n. spp.

Apiocrinidæ, proximal columnal; AGASSIZ (2) p. 51.

†*Apiocrinus*, interbrachials compared with *Calamocrinus*, p. 37; tegmen compared with *Calamocrinus*, p. 40; stem, p. 47; AGASSIZ (2): origin of colour in fossils; BATHER (11) p. 151. *A. elegans*, Defrance, name restored to *A. parkinsoni*, Auctt., and *A. rotundus*, Mill.; BATHER in BOLTON (23) p. 104: variation in shape; BATHER (11) p. 28. *A. meriani*, Desor; GREPPIN (104) p. 99. *A. milleri*, Goldf.; SIEMIRADZKI (244) p. 142. *A. parkinsoni*, Schloth, see *A. elegans*. *A. polycyphus*, Desor sp.; FOX-STRANGWAYS (87) II, p. 198. *A. rotundatus* [error for *rotundus*], Miller, see *A. elegans*.

†*Arachnocrinus*, validity disputed; BATHER (11) p. 168.

†*Atelestocrinus*, systematic position; *op. cit.* p. 114.

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†*Austinocrinus erckerti*, see *Balanocrinus*.

†*Bactrocrinus* : genus maintained, systematic position; type *B. fusiformis*, Schnur ; BATHER (11) pp. 101–104.

†*Baerocrinus*, morphology ; *op. cit.* p. 21.

†*Balanocrinus* :—*B. erckerti*, Dames, Tertiary ?, Turkestan, columnals only; ROMANOVSKII (223) p. 85. *B. sigmaringensis*, Quenst.; GREPPIN, Abh. Schweiz. pal. Ges. xx, p. 100.

B. africanus, Senonian, Tunis, stem only; LORIOL (153) p. 391, n. sp.

†*Barycrinus*, independence questioned ; BATHER (11) p. 116. *B. sculptilis*, Hall, now first figured ; WHITFIELD (271) p. 29.

B. formosus, Keokuk Group, Indiana, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 33 ; *B. stellifer*, Keokuk Group, Harrison co., Indiana, MILLER, Pal. Indiana, 1892, p. 46 : n. spp.

Bathycrinus, orientation of stem ; BATHER (11) p. 44. *B. carpenteri*, Dan. & Kor. sp., complete anatomical and histological description ; DANIELSSEN (61).

†*Batocrinus*, stem ; AGASSIZ (2) p. 62. *B. æquibrachiatus*, var. *alatus*, Hall, now first figured, distinguished from *B. æquibrachiatus*, McChes., and compared with *B. asteriscus* ; *B. asteriscus*, M. & W. ; WHITFIELD (271) p. 11. *B. clypeatus*, Hall; WHITFIELD (271) p. 15. *B. icosidactylus* and *B. irregularis*, translation of the original description by Casseday, 1854 ; MILLER, Pal. Indiana, 1892, p. 23. *B. inornatus*, Hall, now first figured and distinguished (?) from *B. clypeatus*, p. 15 ; *B. laura*, Hall, p. 17, *B. lepidus*, Hall, p. 16, both now first figured ; *B. oblatus*, Hall, now first figured, but referred (?) to *B. rotundus*, Yand. & Sh., p. 12 ; WHITFIELD (271).

B. æquabilis, p. 25, *altiusculus*, p. 20, *aspratilis*, p. 21, Burlington Group, Missouri, MILLER & GURLEY, Bull. Ill. Mus. iii ; *B. bisbrachiatus*, Burlington Limestone, Iowa, WHITFIELD, Mem. Amer. Mus. Nat. Hist. i, p. 14 ; *B. blairi*, p. 39, *brittsi*, p. 33, *comparilis*, p. 32, Burlington Group, Sedalia, Mo., *B. decrepitus*, p. 34, Keokuk Group, Montgomery Co., Ind., *divalis*, Keokuk Group, Boonville, Mo., p. 22, MILLER, Pal. Indiana, 1892 ; *B. laetus*, Burlington Group, Missouri, p. 24, *lyonanus*, St. Louis Group, Kentucky, p. 18, *scyphus*, Burlington Group, Missouri, p. 23, MILLER & GURLEY, Bull. Ill. Mus. iii ; *B. shepardi*, Burlington Limestone, Springfield, Mo., ROWLEY, Amer. Geol. xii, p. 305 : n. spp.

†*Belemnocrinus*, morphology ; BATHER (11) p. 21.

†*Blairocrinus* :—*B.* sp.; ROWLEY (227) p. 50.

B. arrosus and *B. bullatus*, Chouteau Limestone, Sedalia, Mo., MILLER, Pal. Indiana, 1892, p. 41 ; *B. spinosulus*, Chouteau Limestone, Missouri, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 28 : n. spp.

Botryocrinites, defined ; BATHER (11) p. 114.

†*Botryocrinus*, rediagnosed, but independence questioned, pp. 114 & 116 ; *B. corallum*, Ang., considered as young of *B. ramosissimus*, p. 117 ; *B. crassus*, Whiteaves sp., p. 103 ; *B. cucurbitaceus*, Ang. sp., rediagnosed, true structure of arms and anal tube described, p. 120 ;

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B. nucleus, Hall sp., p. 104 ; *B. polyxo*, Hall sp., p. 105 ; *B. ramosissimus*, Ang., rediagnosed, morphological description, senile stages, attack of parasites, p. 117 ; BATHER (11).

†*Bourgueticrinus alabamensis*, de Lor. ; CLARK (36) p. 25.

†*Cainocrinus andreæ*, de Loriol, in Inferior Oolite ; GREPPIN (103).

Calamocrinus, AGASSIZ (3) p. 78. *C. diomedæ*, A. Agass., detailed description, comparison with other and especially with extinct Crinoids, and discussion of systematic position, remarkable figures of minute skeletal structure, and coloured plate of living animal ; AGASSIZ (2).

Calceocrinidæ, redefined, literary history, morphological investigation, and evolution ; BATHER (11) pp. 54–67.

†*Calceocrinus*, rediagnosed, name discussed, detailed morphological description, evolution of genus and species ; *op. cit.* pp. 21 & 54–67. *C. articulosus*, Bill., see *Castocrinus*. *C. barrandei*, Walcott, see *Euchirocrinus*. *C. barrisi*, Worthen, p. 66 ; *C. bidentatus*, Ring., pp. 56–66 ; BATHER (11). *C. bradleyi*, M. & W., see *Halysiocrinus*. *C. clarus*, Hall sp. ; *op. cit.* pp. 66 & 75. *C. chrysalis*, Hall, see *Euchirocrinus*. *C. contractus*, Ring., pp. 55 & 66. *C. dactylus*, Hall, syn. of *Halysiocrinus ventricosus*, pp. 63 & 66 ; *C. fletcheri*, Salter sp., pp. 66 & 74 ; *op. cit.* *C. furcillatus*, W. R. Bill. sp., see *Castocrinus*. *C. gotlandicus*, Ang., rediagnosed, detailed morphological description, pp. 70, 73, & 77 ; *C., cf. gotlandicus*, Upper Silurian, Gotland, p. 81 ; *C. halli*, Ring., pp. 55, 57, & 66 ; BATHER (11). *B. indianensis*, S. A. Miller, see *Euchirocrinus*. *C.* (?) *lamellosus*, Hall sp. ; *op. cit.* p. 66. *C. perplexus*, Shum., see *Halysiocrinus*. *C. radiculus*, Ring., see *Euchirocrinus*. *C. robustus*, Worthen, see *Halysiocrinus*. *C. rugosus*, W. R. Bill., see *Castocrinus*. *C. stigmatus*, Hall sp., radial facet, pp. 56, 66, & 70 ; *C., cf. tenax*, Upper Silurian, Gotland, p. 90 ; *C. typus*, Ring., pp. 56, 57, 65, & 66 ; BATHER (11).

C. interpres, Klinteberg, Gotland, Upper Silurian, supplementary plates, stem, pp. 69, 75, 77, & 94, *C. nitidus*, Upper Silurian, Gotland, p. 91, *C. pinnulatus*, Upper Silurian, S. Gotland and Fårö, anal tube, pinnules, stem, pp. 71, 74, 76, 77, & 96, *C. pugil*, Upper Silurian, Follingbo, Gotland, supplementary plates, pp. 70 & 82, *C. tenax*, Upper Silurian, Gotland, supplementary plates, anal tube, stem, pp. 70, 71, 75, 77, & 88, *C. tucanus*, Upper Silurian, Gotland, supplementary plates, pp. 70 & 86, BATHER, Svenska Ak. Handl. xxv, No. 2 : n. spp.

†*Callicrinus costatus*, His. sp. ; *op. cit.* p. 11.

Calycanthocrinus, Follm., morphology ; *op. cit.* pp. 21, 22, 26, 34.

†*Carpocrinus ornatus*, Ang. sp. ; *op. cit.* p. 4. †*C. simplex*, Phill. sp. ; *op. cit.* pp. 4 & 11.

†*Caryocrinus*, stem ; AGASSIZ (2) p. 60.

†*Castocrinus*, rediagnosed, morphology, and evolution, pp. 21, 56–63, 66, 72, & 75 ; *C. articulosus*, Bill. sp., p. 66 ; *C. billingsianus*, Ring., pp. 59, 60, & 66 ; *C. furcillatus*, W. R. Bill. sp., structure of cup, supplementary plates, pinnules, pp. 59, 60, 66, 70, & 71 ; *C. inæqualis*, E. Bill. sp., p. 66 ; *C. rugosus*, W. R. Bill. sp., pp. 59, 60, & 66 ; BATHER (11).

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†*Catillocrinus*, morphology and systematic position; *op. cit.* pp. 21, 22, & 61.

†*Cheirocrinus* and *Chirocrinus*, syn. of *Euchirocrinus* and *Calceocrinus*; *op. cit.* pp. 55 & 67. *C. chrysalis*, Hall, see *Euchirocrinus*. *C. clarus*, Hall, see *Calceocrinus*. *C. gotlandicus*, syn. of *Calceocrinus gotlandicus* and *C. nitidus*; *op. cit.* pp. 77 & 91. *C. lamellosus*, Hall, see *Calceocrinus*. *C. nodosus*, Hall, syn. of *Halysiocrinus ventricosus*; *op. cit.* p. 66. *C. stigmatus*, Hall, see *Calceocrinus*. *C. tunicatus*, Hall, see *Halysiocrinus*. *C. ventricosus*, Hall, see *Halysiocrinus*. *C. wachsmuthi*, M. & W., syn. of *Halysiocrinus ventricosus*; *loc. cit.*

†*Closterocrinus*, systematic position; *op. cit.* p. 107.

†*Coeliocrinus dilatatus*, Hall, now first figured; WHITFIELD (271) p. 33.

Comatula echinoptera, Müll., see *Actinometra pulchella*.

†*Corymbocrinus corolliferus*, His. sp.; BATHER (11) p. 12.

†*Cotylederma*; WOODWARD (276) p. 369.

†*Cremacrinus*, Ulr., syn. of *Euchirocrinus*; *op. cit.* p. 56.

†*Crotalocrinus*, Angelin's figures, p. 5; *C. pulcher*, His. sp. p. 12; *C. rugosus*, Miller sp., syn. of *C. verrucosus*, pp. 10, 12, & 13; *op. cit.*

†*Ctenocrinus* sp.; KAYSER (131) p. 67, and Taf. ix, fig. 5.

†*Cupressocrinus*, supposed infrabasals a columnal; BATHER (11) p. 20.

†*Cyathocrinidæ* and series *Cyathocrinites*, defined; *op. cit.* p. 126.

†*Cyathocrinites corolliferus*, His., see *Corymbocrinus*. *C. pinnatus*, Goldf.; *op. cit.* p. 12. *C. pulcher*, His., see *Crotalocrinus*.

†*Cyathocrinus*, origin; BATHER (11) p. 153: stem; AGASSIZ (2) p. 57, *C. acinotubus*, Ang.; WOODS (274) p. 112: rediagnosed, with detailed morphological description; BATHER (11) p. 133. *C. alutaceus*, Ang. syn. of *C. acinotubus* and *C. ramosus*, pp. 133 & 146; *C. cora*, Hall, p. 127; *C. distensus*, Ang., rediagnosed and described, p. 141; *C. glaber*, Ang., rediagnosed and described, p. 138; *C. granulatus*, Ang., syn. of *Gissocrinus incurvatus*, p. 168; BATHER (11). *C. incurvatus*, Ang., see *Gissocrinus*. *C. lævis*, Ang., syn. of *C. ramosus* and *C. visbycensis*, pp. 130, 132, 146; *C. longimanus*, Ang., rediagnosed and discussed, morphological description, cause of colour, pp. 142 & 151; BATHER (11). *C. meekanus*, Shum. sp.; MILLER, Pal. Indiana, 1892, p. 44. *C. monilifer*, Ang., syn. of *C. visbycensis*, pp. 130 & 132; *C. muticus*, Ang., rediagnosed and described, p. 140; *C. polyxo*, Hall, referred to *Botryocrinus*, p. 105; BATHER (11). *C. ramosus*, Ang., rediagnosed and discussed, morphological description, cause of colour; *op. cit.* pp. 146–151: Schloth. sp.; GEINITZ (96) p. 179. *C.* (sp. 4) *squamiferus*, Salter MS., see *Gissocrinus squamifer*. *C. striolatus*, Ang., rediagnosed and described, p. 136; *C. vanhornei*, S. A. Mill., p. 127; BATHER (11). *C. viminalis*, Hall, type-specimen now first figured; WHITFIELD (271) p. 28. *C. waukoma*, Hall, p. 127; *C. zonatus*, Ang., senile stage of *C. ramosus*, pp. 146–148; BATHER (11).

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C. andersoni, Keokuk Group, Iowa, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 30 ; *C. dianæ*, Upper Silurian, Slite, Gotland, BATHER, Svenska Ak. Handl. xxv, No. 2, p. 137 : *C. gorbyi*, Keokuk Group, Gosport, Ind., MILLER, Pal. Indiana, 1892, p. 44 ; *C. signatus*, Keokuk Group, Indiana, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 32 : *C. stellatus*, Carboniferous, Turkestan, columnals only ; ROMANOVSKII (223) p. 81; *C. tumidulus*, Keokuk Group, Indiana, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 31 ; *C. visbycensis*, near Wisby, Gotland, Lower Silurian, morphological description ; BATHER, Svenska Ak. Handl. xxv, No. 2, p. 130 : n. spp.

†*Cyclocrinus hausmanni*, Roem. sp. ; STUBER (255) pp. 95, 98, & 116.

†*Cylicocrinus*, n. g., type *C. canaliculatus*, n. sp., Niagara Group, St. Paul, Ind. ; MILLER, Pal. Indiana, 1892, p. 31.

†*Cyphocrinus*, n. g., type *C. gorbyi*, n. sp., Niagara Group, St. Paul, Ind. ; MILLER, Pal. Indiana, 1892, p. 50.

Decadocrinidæ, defined ; BATHER (11) p. 113.

†*Deltacrinus*, Ulr., syn. of *Calceocrinus* ; *op. cit.* pp. 56, 57, & 67.

Dendrocrinidæ, defined and discussed ; *op. cit.* p. 100.

†*Dendrocrinus*, distinguished from *Homocrinus* ; *op. cit.* pp. 101–103 : stem ; AGASSIZ (2) pp. 57, 59, 60, & 62. *D. alternatus*, Hall. sp. ; BATHER (11) p. 103. *D. ancilla*, Hall, see *Homocrinus*. *D. angustatus*, M. & W. sp. ; *op. cit.* p. 103. *D.* (?) *cambrensis*, Hicks ; BOLTON (23) p. 105. *D. casei*, Meek, regeneration of arms ; FOERSTE (85). *D. gracilis*, Hall sp., p. 104; *D. nucleus*, Hall, referred to *Botryocrinus*, p. 104 ; *D. polydactylus*, Shum. sp., p. 105 ; BATHER (11).

†*Dimerocrinus*, cause of colour ; *op. cit.* p. 151.

†*Dorycrinus*, stem ; AGASSIZ (2) p. 62. *D. pendens*, Hall, now first figured, but referred (?) to *D. unicornis*, Ow. & Sh. ; WHITFIELD (271) p. 18. *D. tricornis*, Hall, now first figured and distinguished from *D. unicornis* ; WHITFIELD (271) p. 19.

D. elegans, Burlington Group, Sedalia, Mo. ; MILLER, Pal. Indiana, 1892, p. 17, n. sp.

†*Ectenocrinus*, morphology, evolution, and systematic position ; BATHER (11) pp. 20, 35, 60, 74 : stem ; AGASSIZ (2) p. 57.

†*Echidnis diluviana*, Montf. ; BATHER (11) p. 10.

†*Edriocrinus sacculus*, Hall ; BEECHER & CLARKE (14).

†*Enallocrinus scriptus*, His. sp. ; BATHER (11) pp. 12 & 13.

†*Encrinites* :—*E. echidnoides*, Schloth., pp. 10 & 12; *E. flexibilis*, His., pp. 11 & 12; *E. flexilis*, His., pp. 10 & 12; *E. orthoceratoides*, Schloth. referred to *Crotalocrinus*, p. 10 ; BATHER (11).

†*Encrinus*, arms only, allied to *E. liliiformis* and *E. aculeatus*, Muschelkalk, Ober-Schlesien ; MICHAEL, Zeitschr. deutsch. geol. Ges. xlv p. 500. *E. aculeatus*, Drey. ; GEINITZ (96) p. 190. *E. beyrichi*, Picard, see *Holocrinus*. *E. carnalli*, Beyr. ; GEINITZ (96) p. 190, *E. cassianus*, Laube ; OGILVIE (205) p. 50. *E. gracilis*, Wagner, referred to *Holocrinus wagneri* : JAEKEL (126). *E. granulosus*

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Münst.; OGILVIE (205) p. 50. *E. liliiformis*, Lam.; GEINITZ (96) p. 190: stem; AGASSIZ (2) p. 58. *E. varians*, Münst.; OGILVIE (205) p. 50. *E. wagneri*, Ben.; GEINITZ (96) p. 190: tegmen.; AGASSIZ (2) p. 42: see also *Holocrinus*.

†*Eretmocrinus*:—*E. attenuatus* (Hall), W. & Sp., now first figured and described, and distinguished from *E. matuta*; *E. matuta*, Hall; WHITFIELD (271) p. 18.

E. cassedayanus (misprinted *lyonanus*), Burlington Group, Iowa, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 17; *E. prægravis*, Keokuk Group, Washington Co., Ind. [the Recorder is informed by Mr. A. C. Benedict, the finder and owner of the type-specimen, that it came from the Knobstone Group in Clark Co.], MILLER, Pal. Indiana, 1892, p. 37: n. spp.

†*Eucalyptocrinus*, stem; AGASSIZ (2) p. 62. *E. regularis*, His. sp., p. 12; *E. rosaceus*, Goldf., pp. 12 & 14; BATHER (11).

E. wortheni, Niagara Group, Tennessee, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 53, n. sp.

†*Euchirocrinus*, rediagnosed, name discussed, morphology, and evolution, pp. 21, 55–66, & 72; *E. barrandei*, Walcott sp., p. 66; *E. chrysalis*, Hall sp., pp. 56 & 66; *E. indianensis*, Miller sp., p. 66; *E. punctatus*, Ulr. sp., supplementary plates, pp. 66 & 69; *E. radiculus*, Ring. sp., supplementary plates, tegmen, stem, pp. 66, 69, 70, & 75; BATHER (11).

†*Eugeniacrinus deslongchampsi*, de Lor.; LIPPMANN & DOLLFUS (150) p. 390. †*E. hoferi*, Goldf.; ENGEL (74) p. 1, ZIMMERMANN (279) p. 129.

†*Eupachycrinus orbicularis*, Hall, type-specimen now first figured; WHITFIELD (271) p. 31.

†*E. parvus*, Coal Measures, Missouri, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 60, n. sp.

†*Euspirocrinidæ*, defined; BATHER (11) p. 107.

†*Euspirocrinus*, Ang., rediagnosed, systematic position, pp. 107 & 108: *E. obconicus*, W. R. Bill., compared with *E. spiralis*, pp. 108, 110, & 113; *E. spiralis*, Ang., rediagnosed, morphological description of type and varieties, p. 108; BATHER (11).

†*Extracrinus*:—*E. briareus*, Mill sp.; WOODWARD (276) p. 369. *E. britannicus*, Schloth sp.; *E. dichotomus*, M'Coy sp.; FOX-STRANGWAYS (87) II, p. 35. *E. fossilis*, Blum., see *E.* and *Pentacrinus briareus*, and *E. britannicus*. *E. subangularis*, Mill sp.; FOX-STRANGWAYS (87) II, p. 35, STUBER (255) p. 151, WOODWARD (276) p. 369.

†*Forbesiocrinus*, stem; AGASSIZ (2) pp. 58 & 60.

F. pyriformis [error for *piriformis*], n. sp., Keokuk Group, Kentucky, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 47.

†*Gasterocoma*, morphology; BATHER (11) p. 21.

Gazacrinidæ, n. fam.; MILLER, Pal. Indiana, 1892, p. 49.

†*Gazacrinus*, n. g., type *G. inornatus*, Niagara Group, St. Paul, Ind.; MILLER, Pal. Indiana, 1892, p. 49.

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†*Gilbertsocrinus*, see under *Goniasteroidocrinus* and *Ollacrinus*.

†*Gissocrinus*, Ang., rediagnosed and discussed, phylogenetic position, p. 152; *G. arthriticus*, Ang., non Phill., referred to *G. typus* and *G. campanula*, pp. 155 & 160; Phill. sp., pp. 168 & 169; *G. elegans*, Ang., rediagnosed and discussed, p. 159; *G. incurvatus*, Ang. sp., ditto, morphological description, p. 168; *G. goniodactylus*, Phill. sp., and var., pp. 166 & 167; *G. macrodactylus*, Ang., rediagnosed and described, p. 165; *G. nudus*, Ang., a worn *G. typus*, pp. 153–156; *G. punctuosus*, Ang., referred to *G. typus* and *G. campanula*, pp. 153, 155, 158–161; *G.* sp., Lower Silurian, Gotland, p. 173; *G. squamifer*, Salter MS., Gotland, p. 167; *G. tubulatus*, Ang., a worn *G. typus*, pp. 153–155; *G. umbilicatus*, Ang., rediagnosed and described, p. 163; BATHER (11).

G. campanula, Upper Silurian, Follingbo, Gotland, morphological description, p. 160, *G. typus*, ditto, p. 155, *G. verrucosus*, Pterygotus Bed, Upper Silurian, Wisby, Gotland, with young stages, p. 171, BATHER, Svenska Ak. Handl. xxv, No. 22, n. spp.

†*Glyptocrinus*, stem, pp. 57, 58, 60 & 62: tegmen, p. 43; AGASSIZ (2). *G. baeri*, *dyeri*, and *neali*, roots; DYCHE (72).

†*Gnorimocrinus loveni*, W. & Sp.; BATHER (11) p. 128.

†*Goniasteroidocrinus lyonanus*, Keokuk Group, Indiana, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 55, n. sp.

†*Gothocrinus*, n. g., with type *G. gracilis*, n. sp., Lower Silurian, Wamlingbo, Gotland; BATHER, Svenska Ak. Handl. xxv, No. 2, p. 114.

†*Graphiocrinus tortuosus*, Hall, now first figured; WHITFIELD (271) p. 32.

†*Halysiocrinus*, n. g. (ex Ulrich), type *Calceocrinus ventricosus*, morphology and evolution, pp. 21, 61, 65, 72, 74, & 75; *H. bradleyi*, M. & W. sp., *H. perplexus*, Shum. sp., *H. robustus*, Worthen sp., *H. tunicatus*, Hall sp., p. 67; *H. ventricosus*, Hall sp., morphology, systematic position, supplementary plates, pp. 62–66 & 70; BATHER (11).

†*Haplocrinus*, morphology; *op. cit.* pp. 20, 25, & 60.

†*Herpetocrinus*, rediagnosed, name discussed, detailed morphological position, evolution, and systematic position, pp. 21 & 36–46; *H. brachiatus*, Hall sp., rediagnosed, p. 46; *H. bridgeportensis*, Miller sp., pp. 37 & 45; *H. convolutus*, Hall sp., rediagnosed, structure of stem, Gotland, pp. 43 & 48; *H. fletcheri*, Salter, rediagnosed, with morphological description, pp. 38, 42, & 46; *H. gorbyi*, S. A. Mill. sp., p. 45; BATHER, Svenska Ak. Handl. xxv, No. 2.

H. ammonis, with vars. *bijugicirrus* and *alternicirrus*, Upper Silurian, Gotland and Dudley, pp. 46, 49, and text, fig. 12; *H. flabellicirrus*, Upper Silurian, Wisby and Follingbo, Gotland, structure of stem, pp. 43–46 & 51; *H. scolopendra*, described in error as n. sp., on p. 53, but referred to *Streptocrinus crotalurus*, on p. 175; BATHER, Svenska Ak. Handl. xxv, No. 2, n. spp.

Heterocrinidæ, redefined; *op. cit.* p. 35.

†*Heterocrinus*, Hall, morphology, evolution, and systematic position; *op. cit.* pp. 20, 25, 26, 35, 60, 72, & 76: stem, AGASSIZ (2) pp. 57

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& 61 : W. & Sp., non Hall, see *Ectenocrinus*. *H. articulosus*, Bill., see *Castocrinus*. *H. bellevillensis*, W. R. Bill., disappearance of right posterior arm; BATHER (11) p. 72. *H. inæqualis*, E. Bill., see *Castocrinus*. *H. simplex* and *subcrassus*, roots; DYCHE (72).

†*Holocrinus*, W. & Sp., syn. of *Dadocrinus* ; BATHER (11) p. 20 : maintained and redescribed with species, *H. beyrichi*, Picard sp., and *H. wagneri*, Ben. sp.; JAEKEL (126).

†*Homocrinus*, discussed and rediagnosed ; BATHER (11) p. 101 : stem ; AGASSIZ (2) p. 60. *H. ancilla*, Hall sp., *H. alternatus*, Hall ; BATHER (11) p. 103. *H. angustatus*, M. & W., see *Dendrocrinus*. *H. crassus*, Whiteaves, referred to *Botryocrinus*, *H. cylindricus*, Hall, p. 103 ; BATHER (11). *H. fusiformis*, see *Bactrocrinus*. *H.* ? *nanus*, Röm.; BATHER (11) p. 104. *H. nucleus*, Hall sp., see *Botryocrinus*. *H. parvus*, Hall ; BATHER (11) p. 105. *H. polydactylus*, Shum., see *Dendrocrinus*. *H.* ? *proboscidialis*, Hall, *H. scoparius*, Hall; BATHER (11) p. 105.

H. tenuis, Lower Silurian, Bursvik, Gotland, BATHER, Svenska Ak. Handl. xxv, No. 2 p. 105, n. sp.

†*Hoplocrinus*, morphology, p. 21 ; *H. dipentas*, Eichw. sp., pp. 102 & 104; BATHER (11).

†*Hybocrinus*, morphology; BATHER (11) p. 21.

†*Hydreionocrinus* :—*H. sanctiludovici*, Worthen, olim *Eupachycrinus*, now first figured ; MILLER & GURLEY, Bull. Ill. Mus. iii, p. 40.

H. crassidiscus, p. 43, *granuliferus*, p. 44, *noduliferus*, p. 41, *subsinuatus*, p. 40, Coal Measures, Missouri, MILLER & GURLEY, Bull. Ill. Mus. iii, n. spp.

Hyocrinus, Thoms., described and discussed ; JAEKEL (125) p. 650.

†*Ichthyocrinus*, stem ; AGASSIZ (2) pp. 59 & 60. *I. burlingtonensis*, Hall, now first figured ; WHITFIELD (271) p. 36.

†*I. greenii*, Keokuk Group, Muldrough Hill, Ky., MILLER, Pal. Indiana, 1892, p. 52, n. sp.

†*Idiocrinus ventricosus*, orals ascribed to *Pisocrinus* ; BATHER (11) pp. 24 & 175.

Inadunata, defined and discussed, p. 19; *Inadunata dicyclica*, new suborder founded and discussed, p. 100 ; *Inadunata monocyclica*, new suborder founded and discussed, p. 20 ; BATHER (11).

†*Iocrinus*, morphology and systematic position ; *op. cit.* pp. 21, 35, & 60.

†*Isis entrocha*, His. ; *op. cit.* p. 10.

†*Lageniocrinus*, morphology ; *op. cit.* p. 21.

†*Lecanocrinus*, stem ; AGASSIZ (2) p. 60.

†*Lyriocrinus*, stem ; *loc. cit.*

†*Mariacrinus*, stem ; *op. cit.* pp. 60 & 63.

†*Marsupiocrinus radiatus*, Ang.; BATHER (11) p. 12.

†*Marsupites* compared with *Antedon*; SEELIGER (241) p. 394.

†*Mastigocrinus loreus*, Bather ; WOODS (274) p. 112.

†*Megistocrinus*, stem ; AGASSIZ (2) p. 61.

†*Melocrinus æqualis*, Niagara Group, St. Paul, Ind., MILLER, Pal.

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Indiana, 1892, p. 48 ; †*M. gregeri*, Hamilton Group, Callaway Mo., ROWLEY, Amer. Geol. xii, p. 303 : n. spp.

Metacrinus interruptus, P. H. Carp., Sahul Bank ; BELL (17) p. 339.

†*Millericrinus* :—*M. echinatus*, Schloth. sp.; FOX-STRANGWAYS (87) II, p. 199. *M. hausmanni*, Roem.; WOODWARD (276) p. 369. *M. polyclonus*, Félix ; AGUILERA (4) p. 17. *M. pratti*, stem ; AGASSIZ (2) pp. 56 & 65.

†*Mycocrinus*, morphology and systematic position ; BATHER (11) pp. 21, 22, & 60.

†*Myelodactylus*, see *Herpetocrinus*. *M. gracilis*, Ang., discussed and part referred to *Gissocrinus macrodactylus*, pp. 40 & 165; *M. heterocrinus*, Ang., referred to *Herpetocrinus fletcheri*, p. 46 ; *M. interradialis*, Ang., probably *Taxocrinus*, p. 40 ; BATHER (11).

†*Myrtillocrinus*, supposed infrabasals a columnal ; *op. cit.* p. 20.

†*Nanocrinus*, morphology ; *op. cit.* p. 21.

†*Ohiocrinus*, morphology and systematic position ; *op. cit.* pp. 20 & 35.

†*Ollacrinus papillatus*, Hall, now first figured ; WHITFIELD (271) p. 36.

†*Onychocrinus*, stem ; AGASSIZ (2) p. 61.

O. parvus, Kaskaskia Group, Indiana, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 52, n. sp.

†*Ophiocrinus*, Ang., see *Streptocrinus*: Charlesw., referred to *Herpetocrinus* ; BATHER (11) pp. 36–39.

†*Orthoceratites echidnoides*, Montf., a crinoid stem ; *op. cit.* p. 10.

†*Palæocrinus*, Bill., phylogenetic position ; *op. cit.* pp. 153, 164, & 174.

†*Parisocrinus curtus*, Müll. sp.; *op. cit.* p. 103.

†" *Pendulocrinus*," Aust. MS., syn. of *Calceocrinus* ; *op. cit.* pp. 57 & 67.

Pentacrinus, orientation of stem ; *op. cit.* p. 44 : stem ; AGASSIZ (2) p. 62.

†*Pentacrinus* :—*P. amblyscalaris*, Thurm.; SIEMIRADZKI (244) p. 142. *P. asteriscus*, Meek & Hayden, redescribed ; CLARK (36) p. 26. *P. australis*, Moore, Queensland, remarks by P. H. Carpenter & P. de Loriol ; ETHERIDGE (76) p. 439. *P. basaltiformis*, Mill.; FOX-STRANGWAYS (87) II, p. 35, LIPPMANN & DOLLFUS (150) p. 390, STUBER (255) p. 151, WOODWARD (276) p. 369 : Middle Lias, Dsiroula and Katzkhi in Imeretien, Caucasus ; NEUMAYR & UHLIG (198) p. 3. *P., cf. basaltiformis*, Mill., Lower Lias, Calabria ; GRECO (100) p. 80 : Lias, Kurremölla in Scania, columnals only ; MOBERG (190) p. 24. *P. briareus*, Mill., from Oxfordian of Brünn ; ZIMMERMANN (279) : see under *Extracrinus fossilis*. *P. bryani*, Gabb, redescribed ; CLARK (36) p. 28. *P. carinatus*, Roem., Senonian of Angoulême ; ARNAUD (9) p. 25. *P. cingulatus* Münst. ; ZIMMERMANN (279) p. 129. *P. desori*, Thurm.; GREPPIN (104) p. 100, SIEMIRADZKI (244) p. 142. *P. gastaldii*, Mich.; SIMONELLI (245) p. 236. *P., cf. gastaldii*, proves depth of Miocene Sea at Angles (Gard) ; SINARD (247). *P. goldfussi*, M'Coy ; WOODWARD (276), p. 369. *P. gracilis*, Charlesw., *loc. cit.*; FOX-STRANGWAYS (87) II, p. 35. *P. interbrachiatus*, Blake; *loc. cit.* *P. johnstoni* [? erroneously

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for *P. johnsoni*, which is syn. of *P. gracilis*], *P. jurensis*, Quenst.; WOODWARD (276) p. 369. *P.* sp., Lias, Kurremölla in Scania; columnal only; MOBERG (190) p. 24. *P. laevigatus*, Münst.; OGILVIE (205) p. 50. *P. laevis*, Mill.; WOODWARD (276) p. 369. *P. milleri*, ? Aust.; FOX-STRANGWAYS (87) II, p. 35. *P. milleri*, Aust.; WOODWARD (276) p. 369. *P. neocomiensis*, de Lor., Balkans; VANKOV (266) p. 97. *P. oceani*, d'Orb.; STUBER (255) p. 169. *P. propinquus*, Münst.; OGILVIE (205) p. 50. *P. psilonoti*, Quenst.; FOX-STRANGWAYS (87) II, p. 35, STUBER (255) p. 71, WOODWARD (276) p. 369. *P. robustus*, Wright; *loc. cit.* *P. scalaris*, Goldf.; *loc. cit.*; FOX-STRANGWAYS (87) II, p. 36. *P.* sp.; *op. cit.* p. 199; FUCINI (90) p. 294: Tunis; PERON in LORIOL (153) p. 392. *P. subcrenatus*, Münst.; OGILVIE (205) p. 50. *P. subsulcatus*, Münst.; STUBER (255) p. 169. *P. subteres*, Goldf.; ZIMMERMANN (279) p. 129. *P., cf. subteroides*, Quenst., Lias, Kurremölla in Scania, columnals only; MOBERG (190) p. 25. *P. tirolensis*, Laube; OGILVIE (205) p. 50. *P. tuberculatus*, Mill.; FOX-STRANGWAYS (87) II, p. 36, MOESCH (192) p. 35, STUBER (255) pp. 79, 84, 95, 98, 105, & 116, WOODWARD (276) p. 369. *P. vulgaris*, Schloth.; FOX-STRANGWAYS (87) II, p. 146.

P. angulati, Lower Lias, "Angulatensandstein," Göppingen, Swabia [insufficiently described and no figure], ENGEL, Jahresh. Ver. Wurttemb. xlviii, p. xlvii; *P.* ? *patulus*, Lias, Kurremölla in Scania, columnals only, MOBERG, Svenska Ak. Handl. xxii, p. 23; *P. peroni*, Lor., Senonian, Tunis, stem only, LORIOL (153) p. 390; *P. whitei*, Jurassic, Utah, CLARK, Bull. U. S. Geol. Serv. No. 97, p. 27: n. spp.

†*Periechocrinus whitei*, Hall, now first figured; WHITFIELD (271) p. 27.

†*Phimocrinus*, morphology; BATHER (11) pp. 20 & 21.

†*Phyllocrinus verrucosus*, Tithonian of Theodosia in Krimea; RETOWSKI, Bull. Soc. Moscow, 1893, p. 289, n. sp.

†*Pisocrinidæ*, redefined; BATHER (11) p. 21.

†*Pisocrinus*, rediagnosed, morphology and systematic position, pp. 21–27; *P. benedicti*, S. A. Mill., pp. 26 & 28; *P. campana*, S. A. Mill., pp. 26 & 27; *P. flagellifer*, Ang. syn. of *P. pilula*, p. 27; *P. gemmiformis*, S. A. Mill., pp. 26 & 28; *P. globosus*, var. of *P. gemmiformis*, p. 27; *P. gorbyi*, S. A. Mill., discussed, p. 27; *P. ollula*, Ang., rediagnosed and described, p. 32; *P. ornatus*, de Kon., syn. of *P. pilula*, p. 27; *P. pilula*, de Kon., rediagnosed, with morphological description, pp. 25–27; *P. piriformis*, Ring. sp., pp. 26–28; *P. pocillum*, Ang., rediagnosed, morphological description, p. 33; *P. tennesseënsis*, C. F. Röm. sp., pp. 23 & 26; BATHER (11).

†*P. quinquelobus*, Niagara Beds, W. Tennessee, BATHER, Svenska Ak. Handl. xxv, No. 2, p. 27, n. sp.

†*Platycrinus*, stem; AGASSIZ (2) pp. 58 & 60. *P. allophylus*; ROWLEY (227) p. 50. *P. clytis*, Hall, now first figured, p. 2; *P. corrugatus*, Ow. & Sh., p. 4; *P. discoideus*, Ow. & Sh., *P. elegans*, Hall, now first figured, *P. excavatus*, Hall, now first figured and distinguished from *P. discoideus*, p. 3; WHITFIELD (271). *P. insolens*, ROWLEY (227)

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p. 50. *P. scobina*, M. & W., now first figured, p. 2; *P. striobrachiatus*, Hall, now first figured and distinguished from *P. corrugatus*, p. 4; WHITFIELD (271).

P. caducus, Keokuk Group, Boonville, Mo., p. 13; *P. chouteauensis*, & *P. colletti*, p. 14, Chouteau Limestone, Sedalia, Mo., MILLER, Pal. Indiana, 1892; *P. hieroglyphicus*, Carboniferous, Turkestan, one radial (?) only, ROMANOVSKII (223) p. 83; *P.* ? *nux*, Middle series of Bowen R. Coalfield, Queensland, ETHERIDGE (76) p. 208 : n. spp.

Plicatocrinidæ, redefined and described; JAEKEL, Zeitschr. geol. Ges. xliv, p. 620.

†*Plicatocrinus*, Münst., rediagnosed and described; JAEKEL (125) p. 634. *P. fraasi*, Zitt., figured and described; *op. cit.* p. 636. *P. hexagonus*, Münst., figured and described; *op. cit.* p. 640.

P. tetragonus, Oxfordian of Hansdorf, near Inowrazlaw, JAEKEL, Zeitschr. geol. Ges. xliv, p. 639, n. sp.

†*Porocrinus* (of Dittmar), stem; AGASSIZ (2) p. 64.

†*Poteriocrinus*, stem; AGASSIZ (2) pp. 59, 61, & 62. *P. alternatus*, Hall; BATHER (11) p. 103. *P. crassus*, Mill., Queensland; ETHERIDGE (76) p. 209. *P. curtus*, Müll., see *Parisocrinus*. *P. davisanus*, S. A. Mill., referred to *Decadocrinidæ*; BATHER (11) p. 104. *P. fusiformis*, Röm., see *Bactrocrinus*. *P. gracilis*, Hall; BATHER (11) p. 104. *P. meekanus*, Shum., referred to *Cyathocrinus*; MILLER, Pal. Indiana, 1892, p. 44. *P. nanus*, Röm., referred to *Homocrinus*, *P. nettelrothanus*, S. A. Mill., a *Decadocrinid*; BATHER (11) p. 104.

P. maschatensis, Carboniferous, Turkestan, fragments only; ROMANOVSKII (223) p. 82; *P.* ? *smithii*, Gympie Beds, Queensland; ETHERIDGE (76) p. 209 : n. spp.

†*Proclivocrinus*, Ring., syn. of *Euchirocrinus*; BATHER (11) pp. 56 & 66.

†*Pycnosaccus scrobiculatus*, His. sp.; BATHER (11) p. 13.

Rhizocrinus, compared with *Antedon*; SEELIGER (241) p. 395: orals, p. 45, proximal columnal, p. 55; AGASSIZ (2): orientation of stem; BATHER (11) p. 44. *R. rawsoni*, locality corrected; AGASSIZ (2) p. 66.

†*Rhodocrinus*, stem; AGASSIZ (2) p. 57. *R.* sp., Carboniferous, Turkestan, columnals only; *R. verus*, Mill., Turkestan, columnals only; ROMANOVSKII (223) p. 84.

†*R. benedicti*, Keokuk Group, Harrison Co., Ind., MILLER, Pal. Indiana, 1892, p. 15; *R. tuberculatus*, Carboniferous, Turkestan, columnals only, ROMANOVSKII (223) p. 85 : n. spp.

†*Saccocoma*, Agass., described and discussed, p. 659; *S. pectinata*, Goldf., figured, pl. xxix; *S. tenella*, Goldf., figured, pls. xxix & xxx; JAEKEL (125).

†*Saccocrinus*, tegmen, p. 43; stem, p. 60; AGASSIZ (2)

†*S. benedicti*, p. 29, *howardi*, p. 30, Niagara Group, St. Paul, Ind., MILLER, Pal. Indiana, 1892, n. spp.

†*Scalpellum sulcatum*, Auriv., described by Hisinger as "*Crinoidis columnæ fragmentum*"; BATHER (11) p. 12.

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†*Scaphiocrinus* :—*S. carinatus*, Hall, now first figured; WHITFIELD (271) p. 31.

S. arrosus, Keokuk Group, Indiana, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 39; *S. lyoni*, Keokuk Group, Crawfordsville, Ind., p. 45, *maniformis*, Keokuk Group, Washington Co., Ind., p. 46, MILLER, Pal. Indiana, 1892; *S. martinensis*, Kaskaskia Group, Indiana, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 38 : n. spp.

†*Sicyocrinus*, Ang., see *Botryocrinus*.

†*Solanocrinus costatus*, Goldf., a crown from Swabia; ENGEL (74) p. xlix.

†*Steganocrinus benedicti*, Keokuk Group, Canton, Washington Co., Indiana, MILLER, Pal. Indiana, 1892, p. 27, n. sp.

†*Stemmatocrinus* sp., Gympie Beds, Queensland; ETHERIDGE (76) p. 208.

†*Stephanocrinus cornetti*, Niagara Group, Madison, Ind., MILLER, Pal. Indiana, 1892, p. 12, n. sp.

†*Stortingocrinus*, morphology; BATHER (11) p. 21.

†*Streptocrinus*, W. & Sp., discussed and rediagnosed, p. 122; *S. crotalurus*, Ang. sp., rediagnosed, morphological description, pp. 123 & 175; BATHER (11).

†*Strotocrinus venustus*, Burlington Group, Iowa, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 26, n. sp.

†*Stylocrinus*, morphology; BATHER (11) p. 21.

†*Symbathocrinus*, morphology and systematic position; BATHER (11) pp. 20–22 & 25.

Synbathocrinus tennesseënsis, see *Pisocrinus*.

†*Talarocrinus trijugis*, St. Louis Group, Illinois, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 45, n. sp.

†*Taxocrinus*, stem; AGASSIZ (2) pp. 62 & 64. *T. distensus*, Ang., distinguished from *Cyathocrinus distensus*, pp. 141 & 142; *T.* ? *interradialis*, Ang. sp. (*Myelodactylus* of Angelin), p. 40; BATHER (11). *T. juvenis*, Hall, now first figured; WHITFIELD (271) p. 35. *T. oligoptilus*, Pacht sp., stem; AGASSIZ (2) p. 58.

T. colletti, White (as var. of *T. multibrachiatus*, here raised to specific rank); MILLER & GURLEY, Bull. Ill. Mus. iii, p. 49; *T. concavus*, Hamilton Group, Callaway Co., Mo., ROWLEY, Amer. Geol. xii, p. 304; *T. crawfordsvillensis*, Keokuk Group, Indiana, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 49 : n. spp.

†*Teleiocrinus ægilops*, Hall, now first figured; WHITFIELD (271) p. 20.

†*Tetracrinus*, Münst., rediagnosed and described, p. 641; *T. moniliformis*, Münst., rediagnosed and described, p. 647; JAEKEL, Zeitschr. geol. Ges. xliv.

†*T. langenhani*, Oxfordian of Hansdorf, near Inowrazlaw, *op. cit.* xliv, p. 648, n. sp.

†*Thiollericrinus*, CUÉNOT (58): ancestor of *Antedon*; BATHER (10) p. 276.

†*Thysanocrinus*, colour of fossils; BATHER (11) p. 151.

†*Trematocrinus papillatus*, Hall, see under *Ollacrinus*.

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†*Triacrinus*, morphology and systematic position, pp. 21, 22, 25, 26, & 32; *T. depressus*, anal plate, p. 26; BATHER (11). *T. globosus*, Ring., see *Pisocrinus*. *T. pyriformis*, Ring., see *Pisocrinus piriformis*.

†*Uintacrinidæ*, diagnosed; CLARK (36) p. 21.

†*Uintacrinus socialis*, Grinn., diagnosed and fully described, with new details; CLARK, (36) p. 21.

†*Ulocrinus blairi*, p. 57, *U. occidentalis*, p. 58, Coal Measures, Missouri, MILLER & GURLEY, Bull. Ill. Mus. iii : n. spp.

†*Vasocrinus*, should it supplant *Botryocrinus*?; BATHER (11) pp. 114 & 116.

†*Zeacrinus*, stem; AGASSIZ (2) p. 58. *Z. scoparius*, Hall, now first figured and distinguished from *Z. troostanus*; *Z. troostanus*, M. & W.; WHITFIELD (271) p. 34.

Z. bellulus, Kaskaskia Group, Indiana, p. 34, *nitidus*, Kaskaskia Group, Illinois, p. 36, *obesus*, Kaskaskia Group, Virginia, p. 35, MILLER & GURLEY, Bull. Ill. Mus. iii, n. spp.

(G.)—†CYSTIDEA.

Æthocystites, n. g., with type *A. sculptus*, n. sp., Niagara Group, St. Paul, Ind.; MILLER, Pal. Indiana, 1892, p. 9.

Agelacrinus blairi, Keokuk Group, Boonville, Mo., MILLER, Pal. Indiana, 1892, p. 12, n. sp.

Caryocystis granatum, Wahlenb. sp.; BATHER (11) p. 11. *C. testudinaria*, Buch, *non* His.; *op. cit.* p. 12.

Dendrocystites, relations to later Echinoderms; SEELIGER (241) pp. 410 & 418.

Echinosphæra aurantium, Gyll. sp.; BATHER (11) p. 12.

Holocystis amplus, Niagara Group, Madison, Ind., MILLER, Pal. Indiana, 1892, p. 8.

Sphæronis pomum, Gyll. sp.; BATHER (11) p. 13.

Sphæronites granatum, Wahlenb., see *Caryocystis*. *S. testudinarius*, His., referred to *Caryocystis granatum*; *op. cit.* p. 11.

Stribalocystites gorbyi, Niagara Group, St. Paul, Ind., MILLER, Pal. Indiana, 1892, p. 11, n. sp.

(H.)—†BLASTOIDEA.

Granatocrinus roemeri, *G.* sp.; ROWLEY (227) p. 50.

G. mutabilis, Chouteau Limestone, Curryville, Mo., ROWLEY, Amer. Geol. xii, p. 306; *G. sphæroidalis*, Kaskaskia Group, Kentucky, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 65; *G.*? *wachsmuthi*, Gympie Beds, Queensland, ETHERIDGE (76) p. 211; *G. winslowi*, Burlington Group, Illinois, MILLER & GURLEY, Bull. Ill. Mus. iii, p. 66 : n. spp.

† All extinct.

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Mesoblastus **?** ***australis***, Gympie Beds, Queensland, ETHERIDGE (76) p. 210 n. sp.

Nucleocrinus greenei, p. 62, ***N. venustus***, p. 63, Upper Helderberg Group Kentucky and Ohio, MILLER & GURLEY, Bull. Ill. Mus. iii, n. spp.

Orophocrinus conicus, W. & Sp., referred to ***O. whitei***, Hall sp., p. 37; ***O. whitei***, Hall, now first figured, p. 36 ; WHITFIELD (271).

Tricoelocrinus **?** ***carpenteri***, Gympie Beds, Queensland, ETHERIDGE (76) p. 212, n. sp.

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3

With Compliments of
F. A. BATHER
British Museum (Nat. Hist.)
London, S.W.

A Record of, and Index to the Literature of ECHINODERMA published during the year 1894, with a few items from previous years.

Compiled by F. A. Bather.

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TO ZOOLOGISTS AND PALÆONTOLOGISTS.

First, the Recorder offers his sincere thanks to those who have helped this work by sending copies of their writings. Such help is especially valuable in the case of works that are published either independently or in serial publications difficult of access.

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XIV. ECHINODERMA.

BY

F. A. BATHER.

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INTRODUCTION.

I. TITLES Analysis of dates.

2	from	publications of	1887.
1	„	„ „	1888.
1	„	„ „	1889.
2	„	„ „	1890.
1	„	„ „	1891.
3	„	„ „	1892.
10	„	„ „	1893.
20	anterior	to	1894.
113	from	publications of	1894.

133 Total recorded.

Of these books and papers 7 have not been seen, although, with possibly two exceptions, they occur in publications that should have been

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accessible before the work was closed. The Recorder has also been unable to see, as yet, the three papers (138, 142, 277) that were the only ones unseen in the Record for 1893. There is good reason to believe that many publications anterior to 1895, and containing Echinoderm literature, remain unrecorded. These facts alone are enough to show the impossibility of preparing a complete Record for any one year, under the present system.

Under each title, references are given to such Abstracts and Reviews as seem of importance to the student of Echinoderms. References are also given to similar Abstracts and Reviews published in 1894, but dealing with previously recorded literature. Such are entered under the name of the authors reviewed, and are neither numbered in the series nor indexed.

The figures in square brackets that follow each title are cross-references to the divisions of the Subject- and Systematic Indices. For instance, [II, B, ii, d, 1] informs the reader that a reference to the paper will be found in Division II, BIOLOGY ; Section (B), MORPHOLOGY ; Subject (ii) **Variation** ; Special case (d), Meristic variation ; (1) Variation from pentamerous symmetry. References to the Systematic Index (IV) are only given when new genera and species are described or alterations made in nomenclature. By this system, those who wish to learn the contents of a paper can easily do so ; while those who do not wish such information can pass by without complaint.

II. BIOLOGY. This Index has been drawn up on the same lines as last year, and for the present it has been thought advisable to employ the same catch-numerals to number the respective subjects. Since there is much less biological work to record this year, several of these catch-numerals are absent. It is hoped that the apparent inconsequence thus introduced will help those who use consecutive volumes for a special point, and will not puzzle those who refer to a single volume.

III. DISTRIBUTION. The small number of items in this Index, as compared with last year, has enabled a change to be made in the arrangement of Section A, Geographical Distribution. It is unfortunate that neither the Star-fish and Sea-urchins themselves, nor the people that dredge for them, will limit their range to the areas of the text-book.

IV. SYSTEMATIC. This index is complete, with certain exceptions noted in List of Titles. Used in combination with the above-mentioned cross-references, it will put the student on the track of everything said about any species that has been alluded to in the year's literature.

This Index contains 240 new species, and 26 new genera, distributed as follows :—*Holothurioidea*, genera 7, species 32; *Echinoidea*, genera 2, species 60 ; *Asteroidea*, genera 12, species 63 ; *Ophiuroidea*, genera 1, species 21; *Crinoidea*, genera 2, species 56; *Cystidea*, genera 2, species 8. There are also many new varieties, and the usual *nomina nuda*.

The new *Holothurioidea* are mostly from E. Central Pacific ; the new

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Echinoidea, from the Cretaceous and Tertiary rocks of France; the new *Asteroidea*, from the E. Atlantic; the new *Ophiuroidea*, from the Indian Ocean; the new *Crinoidea* and *Cystidea*, from the Carboniferous rocks of N. America.

The exactitude of this list is probably vitiated by the vagaries of those authors who are unable to tell us, or to tell us truly, whether the species they describe are old or new, and who delight to throw their readers off the scent by following a different method of quotation and description on every page. Among these bugbears of the recorder are to be reckoned two of the most eminent living writers on Echinoderms.

The arrangement of the Systematic Division, and indeed of the whole Echinoderm Record, follows the plan already laid down by previous recorders and editors. It is capable of great improvement, but changes must be gradual. Meanwhile they who desire a grouping under Orders and Families, may be asked how they would put, let us say, Perrier's new wine, No. 92, into Sladen's old bottles; or whether they think a blending with the Rhenish of Stürtz, No. 115, would make the mixture more easy on the stomach. Should they further complain that the Recorder does not take it on himself to decide which are genera and which subgenera, they may be asked whether, in their classification of the species of *Cidaridæ*, they would follow Schlueter (236, Zool. Rec. 1893), Lambert (57), Cotteau (23), or, possibly, Jeffrey Bell (16, Zool. Rec. 1893). There are enough critics; a recorder's business is to record.

I.—TITLES.*

ALCOCK, A. (5) Zool. Rec. 1893. Abstract, J. R. Micr. Soc. 1894 (Aug.), p. 439.

1. ——. A guide to the zoological collections exhibited in the Invertebrate gallery of the Indian Museum. 155 pp., 1 folding plate. Calcutta, 8vo. [*Ech. Ast. Oph. Crin. Hol.* II, B, i : D, i.]

2. ——. Illustrations of the Zoology of the Royal Indian Marine surveying steamer Investigator Echinoderma I. pls. i–iii. Calcutta, 4to.

 Gives figures of the previously described—*Pararchaster huddlestonii*, *P. violaceus*, *Dytaster anacanthus*, *Pentagonaster pulvinus*, *Zoroaster zea*, *Persephonaster rhodopeplus*, *P. cœlochiles*, *Anthenoides sarissa*, *Pontaster hispidus*, *Pseudarchaster mosaicus*, and *Dipsacaster pentagonalis*.

* An asterisk prefixed to a quotation indicates that the Recorder has not seen the Journal or Work referred to.

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3. ANDERSON, A. R. S. Natural History notes from H.M. Indian Marine survey steamer "Investigator," Commander C. F. Oldham, R.N., commanding. Series II, No. 16. On the Echinoidea collected during the season 1893–1894. J. Asiat. Soc. Bengal, lxiii (ii), pp. 188–195. [II, D, v, c. III, A, iii. IV, c.]

Abstract, by LUDWIG, Zool. Centralbl. ii, p. 197 (May, 1895).

4. ANDREAE, A. Das Vorkommen von Ophiuren in der Trias der Umgebung von Heidelberg. Mt. Badisch. Geol. Landesanst. iii, pp. 1–10. [III, B, ii, e : iv, b. IV, E.]

Abstracts,—by BENECKE, N. Jahrb. Min. 1895, i, pp. 205 & 206 ; by A. BITTNER, Verh. geol. Reichsanst. iii, p. 130 ; by LUDWIG, Zool. Centralbl. ii, p. 145 (April, 1895).

5. ANON. Autotomy in Echinoderms. Nat. Sci. v, p. 4 (July). [II, D, vii.]

Discusses CHADWICK, H. Zool. Rec. 1891, and DANIELSSEN, D. C. (61) Zool. Rec. 1893.

6. BATESON, W. Materials for the study of variation treated with especial regard to discontinuity in the origin of species. xv & 598 pp. London, 8vo. [*Echinoderma*, pp. 421, 429, & 432–447. II, B, ii.]

7. BELL, F. J. On the Echinoderms collected during the voyage of H.M.S. "Penguin," and by H.M.S. "Egeria," when surveying Macclesfield Bank. P. Zool. Soc. London, 1894, pp. 392–413, pls. xxiii–xxvii (May). [II, B, i, a, d, f; ii, b, d : D, vii: F, iii; iv, b. III, A, iv. IV, C, D, E, F.]

Abstracts,—Nat. Sci. v, pp. 327 & 328 (Nov.) ; J. R. Micr. Soc. 1894 (Dec.), pp. 688 & 689.

8. BIELZ, E. A. Miocänes Petrefactenlager von Michelsberg. Verh. Siebenb. Ver. xliii, pp. 92 & 93. [III, B, ii.]

BITTNER, A. Zool. Rec. 1891. Abstract by T. EBERT, N. Jahrb. Min. 1894, i, pp. 203 & 204.

9. ——. Einige Bemerkungen zu Gauthier's Besprechung meiner Mittheilung "Ueber *Parabrissus* und einige andere alttertiäre Echinidengattungen." Verh. geol. Reichsanst. xi, pp. 258–261 (Sept. 1893). [IV, C.]

10. BOAS, J. E. V. Lehrbuch der Zoologie, für Studirende und Lehrer. Zweite vermehrte und verbesserte Auflage. x & 603 pp., 427 figures in text, mostly original. Jena, 8vo (May). [II, B, i.]

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11. BÖSE, E. Geologische Monographie der Hohenschwangauer Alpen. Geognost. Jahresh. vi, pp. 1–48. [III, B, iv, b.]

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12. Botto-Micca, L. Fossili degli "strati a *Lioceras opalinum* Rein. e *Ludwigia murchisonæ* Sow." Della croce di Valpore (M. Grapa) provincia di Treviso. Boll. Soc. geol. Ital. xii, pp. 143–193, pl. i (1893). [III, B, iii.]

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14. Boyle, C. B. A catalogue and bibliography of North American Mesozoic Invertebrata. Bull. U. S. Geol. Surv., No. 102 (1893). [II, E, iii.]

15. Braem, F. Ueber den Einfluss des Druckes auf die Zellteilung und über die Bedeutung dieses Einflusses für die normale Eifurchung. Biol. Centralbl. xiv, pp. 340–353 (May). [II, F, vii.]

16. Brive, A. Terrains Miocènes de la région de Carnot (Algérie). Bull. Soc. geol. France, 3 ser., xxii, pp. 17–29 (April). [III, B, ii.]

17. Capellini, G. *Rhizocrinus santagatai* e *Bathysiphon filiformis*. Rend. Acc. Lincei, iii (iv), pp. 211–218 (March). [IV, F.]
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19. Cattaneo, G. Gli amoebociti dei Cefalopodi e loro confronto con quelli d'altri invertebrati. Atti Univ. Genova, xi, pp. 1–50, pls. i–iv (1892). [II, B, i, a, c.]

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20. Chernuishev, Th. Zamyetka o ghertzinskoĭ faunye vostochnagho sklona Urala. (Note sur la faune hercynienne du versant oriental de l'Oural.) Bull. Com. geol. St. Petersb. xi, pp. 117–134 (1892). [III, B, iv. IV, F.]

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Collin, A. See Meissner, M., & Collin, A.

21. Cooper, J. G. Catalogue of Californian fossils. Bull. Calif. Mining Bureau, No. iv (Sept.). [III, B, ii.]

Cotteau, G. H. (43) Zool. Rec. 1893. Abstract by C. Vélain, Rev. Trav. sci. xiv, pp. 518–520. (44) Zool. Rec. 1893. Abstract by C. Vélain, Rev. Trav. sci. xiv, pp. 517 & 518; and in Rev. Scient. (4) i, p. 120. (46) Zool. Rec. 1893. Abstract by E. Oustalet, Rev. Trav. sci. xiv, pp. 1059 & 1060.

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22. [COTTEAU, G. H.] Sur quelques espèces d'Échinides du Liban. C.R. Ass. Franc. (1893) pp. 346–360. [*Cf.* (47) Zool. Rec. 1893. Is "F. COTTEAU" the same author?] [III, B, iii. IV, C.]

23. ——. Éocène, Échinides. T. II. Pal. franc. Terrains Tertiaires :— Livr. 32, April, 1894, pp. 673–720, pls. cccIxv–cccIxxvi ; Livr. 33, May, 1894, pp. 721–788, pls. cccIxxvii–cccIxxxiv. [III, B, ii. IV, C.]
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30. FARQUHAR, H. Description of a new species of *Ophiuridæ*. Tr. N. Zealand Inst. xxvi, pp. 109–111, pl. ix (May). [II, D, vii. IV, E.]

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35. ——. Preliminary note on a new theory of the phylogeny of the Chordata. Zool. Anz. xvii, pp. 122–126 (April). [II, F, i.]

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36. ——. Faunistic notes at Plymouth during 1893–4. With Observations on the breeding seasons of Marine animals, and on the periodic changes of the floating fauna. J. Mar. Biol. Ass. iii, pp. 210–235 (Oct.). [II, F, i, d.]

37. GAUTHIER, V. Notes sur les Échinides Crétacés recueillis en Tunisie par M. Aubert, &c. Annexe de la Carte géologique de la Tunisie, 52 pp., iv pls. Paris, 8vo (1892). [II, B, ii, b, d. III, B, iii. IV, C.]

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38. ——. Échinodermes. Annuaire geol. ix, pp. 847–876 (June, 1894). [*Ech. Crin. Ast.*]

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II.—BIOLOGY.

(A.) EVOLUTION.

Evolution of ambulacral grooves, nerves, and epineural canals; LANG (58).

Phylogeny of *Echinoderma* fully discussed; LANG (59) p. 1139.

Evolution of the *Crinoidea*; JAEKEL (44).

(B.) MORPHOLOGY.

(i.) Anatomy.

(a) *ECHINODERMA*:—(1) General account; BOAS (10) pp. 133–153.—Complete description of external and internal morphology of all *Echinoderma*; LANG (59) pp. 904–1091.—General account of recent *Echinoderma*, with special reference to those in Indian Seas; ALCOCK (1) pp. 96–110.

(2) Bilateral symmetry of Echinoderm ancestor; MACBRIDE (74).

(5) Homologies of calycinal and radial systems in different groups; BELL (7) p. 409.—Homologies of abactinal poles in *Asteroidea* and *Crinoidea*; MACBRIDE (72) p. 436.

(6) Water-vascular system; MORTENSEN (85) p. 708.—Madreporite compared with collar-pores of *Balanoglossus*; MACBRIDE (73) p. 395.

(7) Dorsal organ, relations to blood-vascular and genital systems, homologies; MORTENSEN (85) p. 711.—Blood and amœbocytes; CATTANEO (19) p. 30.

(b) *HOLOTHURIOIDEA*:—(1) Colour of living Holothurians from sketches; LUDWIG (70) p. 16 and passim.—Detailed anatomy of *Cucumaria glacialis*; MORTENSEN (85).

(2) Spicules, in inner organs of *Euphronides*; LUDWIG (70) p. 43: growth of in *Laetmophasma*; LUDWIG (70) p. 91: of *Pannychia* described; KISHINOUYE (51).—The calcareous ring in *Elpidiinæ*; MARENZELLER (75) p. 18.

(3) Form of tentacles in *Psolus*, phylogenetic relations; LUDWIG (70) p. 139.—Tentacle-ampullæ absent in *Pseudostichopus* (p. 10), *Pælopatides* (p. 19), *Synallactes* (p. 23); LUDWIG (70) p. 26.

(4) Abnormal arrangement of mesenteries in *Benthodytes*; LUDWIG (70) p. 58.

(c) *ECHINOIDEA*:—(2) Skeleton,—Apical system of *Glyphocyphus* (p. 56), *Discoides* (p. 59), and *Hemiaster* (p. 79); fascioles of *Micraster* and relation to *Epiaster* (p. 70); interambulacra and fossæ of *Glyphocyphus* (p. 57): LAMBERT (57).

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(5) Blood of *Echinus esculentus* and *Strongylocentrotus lividus*; CATTANEO (19) p. 31.—Nucleoli in cells of *Echinoidea*; HAECKER (40).

(d) *ASTEROIDEA* :—(1) General anatomy and classification, with special reference to fossils; STÜRTZ (115) pp. 32-86.—General account and Morphology of External Characters, Integument and its Skeleton, Orientation; LUDWIG (71).

(2) Skeleton and tegument described in bearings on Classification (pp. 5–26) in *Brisingidæ* (pp. 46–60); PERRIER (92).—Dermal ossicles defined under terms *paxillæ*, *spinopaxillæ*, *parapaxillæ*, *protopaxillæ*, and *pseudopaxillæ*; VERRILL (125) p. 267.—Calycinal system undecipherable in young *Culcita*; BELL (7) p. 404.—Internal skeleton of *Pararchaster folini*; PERRIER (92) p. 262.

(e) *OPHIUROIDEA* :—(1) General anatomy and classification, with special reference to fossils; STÜRTZ (115) pp. 13–32.

(2) Skeleton of *Astrophyton arborescens*; CAPRIA (18).

(4) Digestive organs of *Astrophyton arborescens*; CAPRIA (18).

(5) Generative organs of *Astrophyton arborescens*; CAPRIA (18).

(f) *CRINOIDEA* :—(1) Skeleton,—Tegmen and anal tube of *Encrinus*; JAEKEL (46 & 47).—Relations of cup-plates; JAEKEL (44) p. 106.—Infrabasalia in *Pentacrinus* from Bathonian; LORIOL (65) p. 494.—Central cup-plate of *Uintacrinus*; WILLISTON (128).

Arms and ambulacra; JAEKEL (44) p. 104.—Remarkable arrangement of syzygies in *Antedon bassett-smithi* and an *Actinometra*; BELL (7) pp. 399 & 402.—Arm-characters of *Taxocrinus concavus*; ROWLEY (102) p. 153.—Arms of *Uintacrinus*; WILLISTON (128).—Pinnulæ contrasted with armlets; JAEKEL (44) p. 112.

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Pores between arms in *Dolatocrinus*; MILLER & GURLEY (81) p. 30.—Pores in cup of *Corymbocrinus*; JAEKEL (44) p. 106.—Madreporite; JAEKEL (44) p. 106.

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(h) *BLASTOIDEA* :—Ambulacra and covering plates minutely described in *Pentremites*; STEINMANN (113).

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(ii) Variation.

(a) In form :—Of *Sphærothuria* ; LUDWIG (70) p. 142 : of *Echinocyamus elegans* and *Laganum delicatum*; MAZZETTI (78) pp. 240 & 241.—In size of *Strongylocentrotus lividus*, smallness due to competition with *Sphærechinus* (p. 419), in size and colour, between littoral and deep-water forms of *Asterias glacialis* (p. 407), *Echinaster sepositus* (p. 408) ; KOEHLER (56).

(b) In form and surface characters :—Size, spines, marginals, form, &c., in *Benthopecten spinosus* (p. 246), *Plutonaster agassizi* (p. 248), *Pseudarchaster intermedius* (p. 249), *Leptoptychaster arcticus* (p. 255), *Isaster bairdi* (p.261), *Ophioglypha saurura* (p. 289), *O. tessellata* (p. 292), *O. bullata* (p. 295) ; VERRILL (125).—Number of jaws in pedicellariæ, *Dorocidaris papillata* and others; BATESON (6) p. 429: (see also II, B, ii, d, 2). In surface characters of *Ophiothrix* ; BELL (7) p. 407.—Marginals of *Rhegaster* ; PFEFFER (93) p. 102.—Spines absent from infero-marginals of *Archaster typicus* young ; BELL (7) p. 402.—In spines on marginals, *Astropecten squamatus* ; KOEHLER (56) p. 410.—Of *Ophioglypha albida* in directions of *O. affinis* and *O. grubei*, buccal shields, &c. ; KOEHLER (56) p. 413.—Modifications in large individuals of *Cyphosoma maresi* ; GAUTHIER (37) p. 22.

(c) In colour :—Abnormally coloured *Ophioglypha albida* (p. 331), colour variations of radial shields in *Ophiothrix fragilis* (p. 336), black *Asterias rubens* (p. 339) ; MEISSNER & COLLIN (80): (see also II, B, ii, a).

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(e) Abnormalities :—Budding of supplementary ray in *Benthopecten spinosus* ; VERRILL (125) p. 246.—Abnormal arrangement of mesenteries in *Benthodytes* ; LUDWIG (70) p. 58.—Asymmetrical *Brissopsis lyrifera*, with prominent posterior ambulacra ; MEISSNER & COLLIN (80) p. 344. —Unusual development of right hydrocœle in larva of *Asterina* ; MACBRIDE (74).

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(C.) PHYSIOLOGY.

Senses of smell and taste in *Asteracanthion*, *Asterias*, *Echinaster*, *Ophioderma*, and *Antedon*; NAGEL (86) p. 175.

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(D.) BIONOMICS.

(i) **General**:—Habits of many recent *Echinoderma*, especially of Indian Seas; ALCOCK (1) pp. 96–110.

Small size of *Strongylocentrotus* when associated with *Sphærechinus*; KOEHLER (56) p. 419.

(iii) **Habitat**:—Pelagic Echinoderms, *Saccocoma*, *Pelagothuria*, *Ophiopteron*; JAEKEL in LUDWIG (67).—*Antedon palmata* in crevices of coral, and habitats of other *Echinoderma*; THURSTON (122) p. 27, and his other papers passim.

(v) **Defence and Protection**:—(b) Concealment,—*Pseudostichopus occultatus* covers itself with shells, foraminifera, and sponge-spicules; MARENZELLER (75) p. 16.—*P. mollis* covers itself with sand and shells of foraminifera; LUDWIG (70) p. 13.

(c) Protective coloration, and colour generally,—Black and white of *Holothuria forskali*, green fluorescence of alcohol extract; KOEHLER (55) p. 4; KOEHLER (56) p. 423.—Yellow of *Maretia alta* becomes purple when handled or immersed in spirit; ANDERSON (3) p. 195.

(vi) **Locomotion**:—A free-swimming, pelagic Holothurian, *Pelagothuria*; LUDWIG (67, 70).

(vii) **Autotomy and Regeneration**:—General account of, in Echinoderms; LANG (59) pp. 1093–1096.—Autotomy, its relation to genital system discussed; ANON (5).

Autotomy of *Asterias richardi*, from 6-armed young to 5-armed adult; MARENZELLER (75) p. 10.

Evisceration and regeneration of disc in *Amphiura*; FARQUHAR (30).—Regeneration of arms by budding in *Patiria briareus*; BELL (7) p. 404.—Regeneration of dorsal papillæ in *Deima*; LUDWIG (70) p. 66.

(viii) **Parasites and Commensals**:—Annelid (*Hermadium pellucidum*) commensal with and mimicking *Ophiothrix echinata*; KOEHLER (56) p. 416.—*Ophiothrix echinata* commensal with sponge *Esperia lorenzii*; RUSSO (105) p. 7.—Parasitic castration of *Amphiura* by Orthonectidæ; KOEHLER (55) p. 4.

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(E.) MISCELLANEOUS.

(i) **Preservation**:—of young *Asterina*; WADDINGTON (126).

(ii) **Economics**:—Conjunctive tissue of *Cucumaria* as bait; KOEHLER (56) p. 425.

(iii) **Bibliography**:—List of chief works on *Echinoderma*; LANG (59) pp. 1147–1154.—Papers on *Echinoderma* of N. of England, many of which have not been quoted in Zool. Rec.; ROEBUCK (100).—Bibliography and Literary History of *Asteroidea*; LUDWIG (71) pp. 467–497.—Mesozoic *Echinoderma*, N. America; BOYLE (14).

(F.) AUXOLOGY.

(i) *ECHINODERMA*:—(b) General Embryology:—Ontogeny of *Echinoderma* and of the extant classes; LANG (59) pp. 1096–1139.

(d) Oviposition:—Breeding seasons of *Echinoderma* at Plymouth, and dates of occurrence of larvæ; GARSTANG (36) p. 228 and passim.

(e) Larval stages:—Præoral lobe of Echinoderm larva; GARSTANG (34): compared with that of *Vertebrata*; WILLEY (127) p. 331: its muscles compared with anterior unpaired muscles of *Balanoglossus* larva; MACBRIDE (73) p. 404.—Relations of Echinoderm larva to larva of ancestral Chordata; GARSTANG (35).—Relations of *Enteropneusta* to *Echinoderma*; MACBRIDE (73) p. 414.

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(c) Tissue-formation:—Growth of spicules in *Lætmophasma*; LUDWIG (70) p. 91.

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gibbosa, especially water-vascular system, axial sinus, dorsal organ, præoral lobe as fixing organ compared with that of Crinoids ; MACBRIDE (72).—*Bipinnariæ* from English Channel, described, compared with *Bipinnaria asterigera*, Sars, and with *Tornaria* ; GARSTANG (34).—Variations, especially in development of right hydrocœle, in larva of *Asterina* ; MACBRIDE (74).

(c) Brephic and Neanic stages :—Brephic stage of *Culcita*, plates figured ; BELL (7) p. 404.—Epiproctal appendage in young of *Psilaster andromeda*, and in *Porcellanasteridæ* ; PERRIER (92) pp. 196, 201.—Full description of *Echinaster sepositus* (?) with R = 5 mm., r = 2 mm. (p. 148), young individuals of *Dorigona* carefully described (p. 367), later growth-stages of *Pentagonaster perrieri* (p. 391) ; PERRIER (92).—Young of *Plutonaster agassizi* (p. 249), stages of *Pseudarchaster concinnus* (p. 253), young of *Bathybiaster robustus* (p. 256), *Pteraster hexactis* (p. 277) ; VERRILL (125).

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(vii) **Experimental investigation** :—Of ova of *Echinus* and *Sphærechinus*, and criticism of BOVERI (25) Zool. Rec. 1893 ; SEELIGER (109).—Production of two or more fused embryos from a single Echinoid egg ; LOEB (62A).—Segmentation of ovum in *Synapta digitata* under pressure ; BRAEM (15).—Rearing of *Asterina gibbosa* in confinement ; WADDINGTON (126).

III.—DISTRIBUTION.

A.—GEOGRAPHICAL.

(i) GENERAL.

Deep sea generally ; HICKSON (43).

(ii) ATLANTIC AND ADJACENT SEAS.

Geographic and Bathymetric distribution of *Asteroidea* collected by "Travailleur" and "Talisman," from 26 to 5005 metres, Mediterranean and Eastern Atlantic, southwards to Cape Verde and westwards to Azores (see also under the different genera) ; there are scattered at random a few species from other localities, such as the Antilles ; PERRIER (92), pp. 1–3, 30–41.

North Sea, S.E. and E. portions, *Oph.*, *Ast.*, *Ech.*, and *Hol.*, in all 29 spp., with stations, depths, and bottom recorded ; MEISSNER & COLLIN (80).

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Coast of U. S. A., *Asteroidea* and *Ophiuroidea*; VERRILL (125).—Bahamas, W. Indies, *Asteroidea*, *Echinoidea*, *Ophiuroidea*; STEARNS (114).

Mediterranean,—La Ciotat, Echinoderms from the shore to 80 metres; habitats; *L. sarsi* recorded; KOEHLER (56).—Cette, Echinoderm fauna; KOEHLER (55).—G. of Naples, *Echinaster*, *Cribrella*, *Opiothrix*, and *Sphærechinus roseus*, n. sp.; RUSSO (105).—Eastern Mediterranean, *Echinoderma* collected; MARENZELLER (75).

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Red Sea,—list of *Echinoidea*, with *Temnechinus scillæ*, *Echinocyamus crispus*, *E. elegans*, *Laganum delicatum*, and *Linthia assabensis*, n. spp.; MAZZETTI (78).—*Echinoderma* collected, comparative localities, *Linckia costæ*, n. sp.; RUSSO (104).

Echinoidea from Ceylon, E. coast, Colombo (*Dorocidaris tiara*, n. sp.), Coromandel coast, Laccadive Sea (*Dorocidaris alcocki*, n. sp.), Malabar coast, Maldive atoll, Palk Straits, Trincomallie harbour; ANDERSON (3).

G. of Manaar, Rámésvaram, habitats and occurrence of *Echinoderma*; THURSTON (120) pp. 14–16, 33 & 34; (121) pp. 77-80, and inserted slip; (122) p. 27.

Mauritius,—*Asteroidea*, *Ophiuroidea*, *Echinoidea*; STEARNS (114).—*Ophiuroidea* with n. spp. of *Ophiopezella*, *Pectinura*, *Ophiarachna*, *Ophiarthrum*, *Ophiothrix*, *Ophiomyxa*, also *Antedon carinata* and *Echinaster sladeni*, n. spp.; LORIOL (64).

(iv) PACIFIC OCEAN AND ADJACENT SEAS.

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China Sea,—Macclesfield Bank, list of Holothurians, Crinoids (*Eudiocrinus granulatus*, *Antedon inopinata*, *A. bassett-smithi*, *A. vicaria*, *A. brevicirra*, *A. flavomaculata*, *A. moorei*, *A. fieldi*, *Actinometra peregrina*, n. spp.), Asteroids (*Archaster tenuis*, young *Culcita*, *Patiria briareus*, *Chaetaster moorei*, n. spp.), Ophiuroids (*Pectinura elegans*, *Ophiocrene ænigma*, n. spp.), and Echinoids (*Salmacis rufa*, n. sp.), with notes and descriptions; BELL (7) p. 396.

Arafura and Banda Seas, list of Crinoids, Asteroids, Ophiuroids, and Echinoids; BELL (7) p. 395.—Ambon, N. W. Borneo, Holothurians; SLUITER (111).

N.W. Australia, list of Holothurians, Crinoids, Asteroids, Ophiuroids, and Echinoids; BELL (7) p. 394.—Thursday Is., Holothurians with *Müllerla lubrica*, n. sp.; SLUITER (111).

California, Mexico, and W. coast America, *Asteroidea*, *Ophiuroidea*, *Echinoidea*; STEARNS (114).—West coast of Central and S. America, Mexico, and Galapagos Is., from 0 to 2300 fms., Holothurians including 30 n. spp.; LUDWIG (70).

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(v) ARCTIC OCEAN AND ADJACENT SEAS.

Spitzbergen, *Echinoderma*, with comparative distribution; PFEFFER (93 & 94.)

White Sea, Solowetskij Is., *Holothuria*, *Ophiuroidea*, *Asteroidea*, *Echinoidea*, no new occurrences; KNIPOWITSCH (52) p. 55.

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(ii) CAINOZOIC.

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(b) **Quaternary**:—S. Nicholas Is., California, *Strongylocentrotus droebachiensis*; COOPER (21) p. 32.

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(c) **Miocene**:—Michelsberg in Siebenbürge, *Echinoidea*; BIELZ (8) p. 93.—Australia, *Arachnoides incisa*, *Laganum platymodes*, n. spp., and other *Echinoidea*; TATE (116).—(Cartennien), Algeria, *Clypeaster*; BRIVE (16) p. 20: *Clypeaster* and *Echinolampas*; REPELIN (95) p. 10.

(d) **Eocene**:—France, Tunis and Algeria, n. spp. of *Brissopsis*, *Linthia*, *Schizaster*, *Pericosmus*, *Echinoneus*, *Oriolampas*, *Cassidulus*, *Pygorhynchus*, *Echinanthus*, *Echinolampas*, *Echinocyamus*, and *Cidaris*; COTTEAU (23).—Australia, *Sismondia murravica*, *Conoclypeus rostratus*, n. spp., and other *Echinoidea*; TATE (116).—(Palæogene), Siebenbürgen, lists of *Echinoderma*; KOCH (54) pp. 228, 241, 280, 287, 297, 302, 314, 327, & 348.—(Parisian and Bartonian), near Thun, Switzerland, lists of *Echinoderma*; MAYER-EYMAR (77) pp. 81, 87 & 120.—(Bartonian), Gassino, lists of *Echinoidea*, *Asteroidea*, and *Crinoidea*; ROVASENDA (101) pp. 416, 418, 420 & 422.

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Upper Cretaceous.—(Sphenodiscus beds = Danien), Baluchistan, Echinoid-fauna compared with that of S. India and Europe; NOETLING (88).—Upper Chalk of Rügen, *Echinoidea*, *Asteroidea*, *Crinoidea*; LAUR

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(61).—(Senonian),—I. of White, *Marsupites* first recorded ; GRIFFITH (39) : (Upper Campanian), Courgeac (Charente) and Talmont (Charente-Inf.), *Antedon arnaudi*, n. sp. ; LORIOL (65) p. 479 : (Coniacian), Rouselières (Charente), *Antedon carentonensis*, n. sp. ; LORIOL (65) p. 483 : (Åhussandsten), S. Sweden, Echinoids including *Catopygus rotundus* and *C. minor*, n. spp. ; HENNIG (42) p. 501 : (Lower Senonian), Bonsecours, near Rouen, *Micraster normanniæ* ; FORTIN (31).—(Cenomanian),—Yonne, Aube, and Marne, horizons and localities of *Echinoidea*, with n. spp. of *Typocidaris*, *Salenia*, *Epiaster*, and *Hemiaster* ; LAMBERT (57) : Le Havre, *Pentagonaster picteti*, n. sp. ; LORIOL (65) p. 476.—Choctaw and Grayson Terranes of *Exogyra arietina* Marl, Texas, lists of *Echinoidea*, with *Holectypus charltoni*, and *Hemipedina charltoni*, n. spp. ; CRAGIN (24 & 25).

Lower Cretaceous.—(Niobrara Chalk), *Uintacrinus* ; WILLISTON (128). —(Albian),—Yonne, Aube, and Marne, horizons and localities of *Echinoidea*, with *Hemiaster cossignyi*, n. sp. ; LAMBERT (57) : Gault of Lains and Viry in French Jura, *Echinoidea* ; BOURGEAT (13) pp. 356 & 357.—(Rhodanian), Perte du Rhône, *Hemipygus rochati*, n. sp. ; LORIOL (65) p. 469.—(Urgonian), Kislovosk, Caucasus, *Peltastes farrei*, n. sp. ; LORIOL (65) p. 471.—(Valenginian, Neocomian, Urgonian), near Thun, Switzerland, lists of *Echinoderma* ; MAYER-EYMAR (77) pp. 69, 74, 77 & 79.

(c) **Jurassic** :—(Sequanian), Nantua (Haute-Vienne), *Glypticus sulcatus* ; LORIOL (65) p. 468.—(Rauracian), Champlitte (Hte.-Saône), *Apiocrinus champlittensis* (p. 485), and Beaune (Côte-d'Or), *Millericrinus burgundicus* (p. 487), and *M. belnensis* (p. 489), n. spp. ; also at Beaune, *M. mespiliformis* (p. 491) ; LORIOL (65).—(Oxfordian),—E. Africa, Usambara, *Cidaris glandifera* ; JAEKEL (45) p. 507 : Mkusi near Tanga, *Cidaris glandifera* ; FUTTERER (33) p. 35.

Lower Jurassic.—Dept. de l'Ain, lists of *Echinoderma* ; RICHE (97) pp. 61, 62, 68, 71, 72, 75, 76, 82, 83, 84, 85, 93, 94, 98.—S. Jura, lists of species with remarks ; RICHE (98) pp. 71, 99, 172, 193, 198, 219, 228, 239, 286, 313, 329, 352.—Petroleum-borings in N. Germany, *Pentacrinus cristagalli* ; FREYSTEDT (32) pp. 129, 136.—(Lower Oolites), England, lists of Crinoids (p. 586), Echinoids (p. 587), Ophiuroids, Asteroids, and Holothuroids (p. 590), and other pp. quoted in § 1 ; WOODWARD (131).—(Bajocian) Allonal, near St. Amour, Jura, *Astropecten carroni*, n. sp. ; LORIOL (65) p. 474.

(d) **Lias** :—Of Piedmont, *Echinoidea*, *Cidaris terrenzii*, n. sp., *Crinoidea*, *Millericrinus gemmatus*, n. sp. ; PARONA (89) Mem. Acc. Torino, xliii, p. 54.—(Upper Lias) Murchisonæ beds, Treviso, Italy, *Pentacrinus*, *Rhabdocidaris* ; BOTTO-MICCA (12) p. 193.—(Lower Lias) Malatra (Isère), *Pentacrinus* ; TERMIER & KILIAN (118) p. 276.

(e) **Rhaetic** :—Of Malsch, near Wiesloch, Ophiurids ; ANDREAE (4).

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(iv) PALÆOZOIC.

(a) **General**:—List of *Crinoidea*, *Blastoidea*, and *Echinoidea*, of Missouri, with horizons and localities ; HAMBACH (41) pp. 66-68.

(b) **Trias**:—(Raibler beds),—*Crinoidea*, *Asteroidea*, *Echinoidea*, detailed list with localities and horizons; WÖHRMANN (130) p. 641 : Friuli, *Echinoidea* recorded ; TOMMASI (123).—(Untere Nodosus-kalk), Mauer near Heidelberg, *Acroura coronæformis* and other Ophiurids ; ANDREAE (4).—(Muschelkalk, Partnachschichten, and Wettersteinkalk), Hohenschwangau, *Encrinus*, *Traumatocrinus*, *Cidaris* ; BÖSE (11) pp. 4, 6, 7.

(c) **Permian**:—East Russia-in-Europe, *Crinoidea* ; NECHAEV (87) p. 116.

(e) **Carboniferous**: — (Carboniferous Limestone), Fossey near Aachen, *Platycrinus* ; DANTZ (29) p. 623.—(Calcaire de Lens), Belgium, composed of Palechinoid plates ; LOHEST (63).—(Lower Carboniferous), Elsass, *Palæchinus*, *Archæocidaris*, *Perischodomus magnus*, n. sp. ; TORNQUIST (124) pp. 100 & 101.

(Kaskaskia Group), n. spp. of *Agelacrinus*, *Zeacrinus*, *Batocrinus* ; MILLER & GURLEY (82). (Warsaw Group), n. spp. of *Alloprosallocrinus*, *Batocrinus* ; MILLER & GURLEY (82). (Keokuk Group), n. spp. of *Poteriocrinus*, *Zeacrinus*, *Barycrinus Symbathocrinus*, *Ichthyocrinus*, *Actinocrinus*, *Dorycrinus*; MILLER & GURLEY (82). (Kinderhook Group), n. spp. of *Agelacrinus*, *Poteriocrinus*; MILLER & GURLEY (82). (Chouteau Limestone), n. sp. of *Platycrinus* ; MILLER & GURLEY (82).

(f) **Devonian**:—(Hamilton Group),—n. spp. of *Dolatocrinus*, *Megistocrinus* ; MILLER & GURLEY (81) : of *Dolatocrinus* ; MILLER & GURLEY (82) : Missouri, *Melocrinus tersus*, *M. lylii*, n. spp.; ROWLEY (102). (Upper Devonian), Sardinia, stems of *Ctenocrinus* and other Crinoids, *Protocystis*, *Mimocystis* ; LOVISATO (66) : Elba, *Actinocrinus* ; STÉFANI (112) p. 32.—Graz, Austria, distribution of *Crinoidea* ; PENECKE (91) p. 609. (Hercynian), Oural, *Crinoidea* ; CHERNUISHEV (20) pp. 121, 123 & 129.

(g) **Silurian**:—Erratic blocks of W. Prussia, *Pentacrinus* said to occur ; KIESOW (50) p. 82.—Australia, *Protaster* ; M'KNIGHT (84). (Lower Ludlow) Church Hill, Shropshire, *Asteroidea*, popular notes ; LA TOUCHE (60). (Niagara Group),—n. sp. of *Lecanocrinus* ; MILLER & GURLEY (81): n. spp. of *Holocystis*, *Caryocrinus*; MILLER & GURLEY (82).

(h) **Ordovician**:—(Trenton Group), n. spp. of *Belemnocystis*, *Archæocrinus*, *Mitrocrinus*, *Porocrinus*, *Carabocrinus*, *Aeniocystis*, *Retiocrinus*, *Glyptocrinus*, *Calceocrinus* ; MILLER & GURLEY (82).—(Bala Beds), Wharfe, Yorkshire, *Atelecystis* ; REYNOLDS (96) p. 109.

(i) **Cambrian**:—Coulouma (l'Hérault), *Trochocystis*; MIQUEL (83) p. 106. (Paradoxides Beds), Bohemia, *Trochocystis* and new Cystid genus; JAHN (48) p. 271.

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IV.—SYSTEMATIC.†

(A.)—ECHINODERMA IN GENERAL.

Systematic review of *Echinoderma* and of classes; LANG (59) pp. 871–901.

(B.)—HOLOTHURIOIDEA.

Ankyroderma danielssen'i, an Antarctic form found N. of Equator, fully described; LUDWIG (70) p. 161. *A. jeffreysi*; PFEFFER (93) p. 122.

A. spinosum, E. Central Pacific, 905–1793 fms.; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 171, n. sp.

Benthodytes gelatinosa, Walsh, referred to *Pœlopatides* (p. 19), and Walsh's imperfect description mournfully reprehended (p. 96); *B. sanguinolenta*, G. of Panama, fully described (p. 54); LUDWIG (70).

B. incerta, E. Central Pacific, 1322 & 1879 fms.; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 60, n. sp.

Capheira, n. g., with type *C. sulcata*, E. Central Pacific, 1573 fms.; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 100, n. sp.

Caudina californica, G. of California, 1588 fms.; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 155, n. sp.

Chirodota lævis; PFEFFER (93) p. 122.

Colochirus cucumis (p. 105), *C. doliolum* (p. 104), *C. quadrangularis* (p. 105); SLUITER (111).

Cucumariidæ, this family name preferred to *Dendrochirotæ*; LUDWIG (70) pp. 7 & 122.

Cucumaria abyssorum, described, var. *hyalina* considered as young, and var. *grandis* as adult; LUDWIG (70) p. 122. *C. frondosa*; PFEFFER (93) p. 123. *C. glacialis*; *l. c.*; anatomy and early development; MORTENSEN (85). *C. minuta* (Fabr.) non Stuxb.; PFEFFER (93) pp. 109 & 123. *C. pentactes*; MEISSNER & COLLIN (80) p. 344. *C. planci*; KOEHLER (56) p. 425; at Cette; KOEHLER (55) pp. 4 & 7.

Deima, rediagnosed (p. 70); *D. pacificum*, E. Central Pacific, from 885 to 1360 fms. (p. 63); LUDWIG (70) Mem. Mus. Harvard, xvii, 3, n. sp.

† A dagger prefixed to the trivial name of a species indicates that it is fossil; prefixed to the name of the author, it denotes that the reference is to the species in a fossil state; prefixed to the name of a genus, it indicates that all species of the genus here recorded are fossil, and the † is therefore not repeated before each name. The abbreviations *l. c.* and *op. cit.* refer only to the place or work quoted *immediately* before.

A name and reference quoted without further statement (*e.g.*, *Chirodota lævis*, above) indicate that the original author's statement refers merely to locality or some question of slight importance. Further information can usually be gleaned from the cross-references under TITLES.

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Deimatinæ, key to genera ; LUDWIG (70) p. 104.

Elpidiidæ, family name to replace the old *Elasipoda* ; LUDWIG (70) pp. 7 & 39.

Euphronides tanneri, N. of Cape San Francisco, 1573 fms. (p. 39) ; *E. verrucosa*, near C. San Francisco and Galapagos Is., 1573 & 1322 fms. (p. 44) : LUDWIG (70) Mem. Mus. Harvard, xvii, 3 : n. spp.

Eupyrgus scaber ; PFEFFER (93) p. 123.

Georisia ornata, Perrier, referred to *Psolidium* ; LUDWIG (70) p. 136.

Holothuriidæ, rediagnosed and divided into subfamilies, *Holothuriinæ* and *Synallactinæ*, with key to genera ; LUDWIG (70) p. 37.

Holothuria atra, and var. *amboinensis* ; SLUITER (111) p. 103. *H. edulis* ; *l. c.* *H. forskali*, littoral and deep-water vars., synonymy ; KOEHLER (56) p. 423 ; at Cette, discussion of name and validity of species ; KOEHLER (55) p. 4. *H. fuscopunctata* ; SLUITER (111) p. 104. *H. impatiens* ; *op. cit.*, p. 104 ; KOEHLER (56) p. 422. *H. intestinalis* ; MARENZELLER (75) p. 15. *H. klunzingeri* ; SLUITER (111) p. 103. *H. languens* ; LUDWIG (70) p. 7. *H. maculata* ; *l. c.* *H. marenzelleri* ; *op. cit.*, p. 8; SLUITER (111) p. 104. *H. marmorata* ; *op. cit.*, p. 103. *H. monocaria* ; *l. c.* *H. olivacea* ; *op. cit.*, p. 104. *H. pardalis* ; LUDWIG (70) p. 7 ; includes *H. insignis*, *H. lineata*, *H. peregrina*, and perhaps *H. subdivita* ; SLUITER (111) p. 104. *H. pervicax* ; *l. c.* *H. poli*, ova described ; CRETY (27) p. 262 ; distinguished from *H. tubulosa* of same locality; KOEHLER (56) p. 422. *H. pyxis*; SLUITER (111) p. 103. *H. scabra*; *l. c.* *H. tubulosa*, ova described; CRETY (27) p. 261. *H. vagabunda* ; SLUITER (111) p. 103 ; range extended to E. Pacific ; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 8. *H. verrilli*, referred to *Synallactinæ* ; *op. cit.*, p. 26.

Kolga ludwigi, between Cerigo and Candia, 755 to 943 metres, and S.E. of C. Malea, 1292 metres ; MARENZELLER (75) Denk. Ak. Wien, lx (v), p. 20, n. sp.

Laetmogone theeli, Galapagos Is., 1322 fms ; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 79, n. sp.

Laetmophasma, n. g., with type *L. fecundum*, E. Central Pacific, 660 to 905 fms., development of spicules fully described ; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 85, n. sp.

Meseres, n. g., with type *M. macdonaldi*, near Cocos and Malpelo Is., 1175 and 899 fms.; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 34, n. sp.

Mesothuria, n. g., with type *M. multipes*, near Galapagos, from 885 to 1270 fms.; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 31, n. sp. [This is the *Mesites* of Ludwig's preliminary notice.]

Muelleria echinites, *M. lecanora*, *M. miliaris*; SLUITER (111) p. 104.

M. lubrica, Thursday Id.; SLUITER (111) Denk. Ges. Jena, viii, p. 104, n. sp.

Myriotrochus rinki ; PFEFFER (93) pp. 109 & 122.

Oneirophanta mutabilis, near Malpelo Id., and Acapulco, redescribed; LUDWIG (70) p. 70.

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O. affinis, near Malpelo Id., 1772 & 1823 fms., with dorsal papillæ in double rows; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 72, n. sp.

Pœlopatides, rediagnosed; LUDWIG (70) p. 21. *P. confundens*, redescribed with internal anatomy, held to include *P. agassizi*; LUDWIG (70) p. 14.

P. suspecta, Gulf of Panama, 1270 fms.; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 20, n. sp.

Pannychia, *cf. moseleyi*, spicules; KISHINOUYE (51), and LUDWIG (68).

P. moseleyi, n. var. *henrici*, E. Central Pacific, 770 to 1421 fms.; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 95.

Pelagothuria, a free-swimming pelagic Holothurian; LUDWIG (67). *P. natatrix* [introduced as n. g., n. sp., but see Zool. Rec. 1893], fully described and figured; LUDWIG (70) p. 114.

Pelagothuriidæ, the family diagnosed; LUDWIG (70) p. 121.

Peniagone vitrea, var. *setosa*, fully described; LUDWIG (70) p. 105.

P. intermedia, E. of Galapagos, 1322 fms.; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 108, n. sp.

Phyllophorus urna; MARENZELLER (75) p. 23; at Cette; KOEHLER (55) p. 7.

P. aculeatus, Panama; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 128, n. sp.

Pseudocucumis acicula; SLUITER (111) p. 105.

Pseudostichopus, rediagnosed; LUDWIG (70) pp. 10 & 14. *P. mollis*, range extended N. of Equator, redescribed; LUDWIG (70) p. 8.

P. occultatus, Eastern Mediterranean, 415–1445 metres, protected by covering of foreign objects; MARENZELLER (75) Denk. Ak. Wien, lx (v) p. 15, n. sp.

Psolidium, rediagnosed, key to species; LUDWIG (70) p. 135. *P. dorsipes*, discussed; *op. cit.*, p. 131.

P. gracile, Gulf of Panama, 1270 fms. (p. 132); *P. panamense*, Gulf of Panama, 1270 fms., an intermediate form between *Cucumaria* and *Psolus* (p. 129): LUDWIG (70) Mem. Mus. Harvard, xvii, 3 : n. spp.

Psolus, evolution of genus (p. 131); *P.* sp., juv., Gulf of Panama (p. 140): LUDWIG (70). *P. fabricii*; PFEFFER (93) pp. 110 & 123. *P. phantapus*; *ll. c.* *P. squamatus*; MEISSNER & COLLIN (80) p. 345.

P. digitatus, Gulf of Panama, 695 fms., peculiar tentacles (p. 138); *P. diomedeæ*, Cocos Id., 66 fms. (p. 136); *P. pauper*, S. of Las Tres Marias, W. of Mexico, 676 fms., perhaps only a var. of *P. fabricii* (p. 139): LUDWIG (70) Mem. Mus. Harvard, xvii, 3 : n. spp.

Psychropotes dubiosa, off Ecuador, 1823 fms. (p. 52); *P. raripes*, N. W. of C. San Francisco, 1573 fms. (p. 48): LUDWIG (70) Mem. Mus. Harvard, xvii, 3 : n. spp.

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Scotoanassa gracilis, N.W. of Galapagos, 1360 fms.; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 111, n. sp.

Scotodeima, n. g., with type *S. setigerum*, Cocos Id.; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 74, n. sp.

Sphærothuria, n. g., with type *S. bitentaculata*, E. Pacific, 676–2232 fms., full anatomical description, relations to other Holothurians discussed; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 141, n. sp.

Stichopus chloronotus; SLUITER (111) p. 104. *S. regalis*; KOEHLER (56) p. 425; MARENZELLER (75) p. 15; at Cette; KOEHLER (55) p. 7. *S. selenkæ*, referred to *Holothuria forskali*; KOEHLER (56) p. 424. *S. variegatus*; SLUITER (111) p. 104.

Synallactes, n. g., with type *S. alexandri*, near Mariato Pt., and at Galapagos Is., 322 & 551 fms. (p. 21); *S. ænigma*, near Malpelo Id. and Galapagos, 1823 & 1322 fms. (p. 26): LUDWIG (70) Mem. Mus. Harvard, xvii, 3: n. spp.

Synapta abyssicola, var. *pacifica*, more fully described; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 174. *S. beselii*; SLUITER (111) p. 105. *S. digitata*; MARENZELLER (75) p. 23; segmentation of ovum; BRAEM (15). *S. glabra*; SLUITER (111) p. 105. *S. godefroyi*; *l. c.* *S. grisea*, n. var. *alba*, Thursday Is.; *l. c.* *S. indivisa*, maintained distinct from *S. reciprocans*; *l. c.* *S. inhaerens*; MEISSNER & COLLIN (80) p. 344; ova described; CRETY (27) p. 264. *S. kefersteinii*, with rudimentary calcareous deposits; SLUITER (111) p. 105. *S. serpentina*; *l. c.* *S. similis* (?); *l. c.*

Theelia, rediagnosed; LUDWIG (70) Mem. Mus. Harvard, xvii, 3, p. 135.

Thyone aurantiacus, at Cette; KOEHLER (55) p. 7. *T. fusus*; MEISSNER & COLLIN (80) p. 345. *T. inermis*; MARENZELLER (75) p. 23.

Thyonidium pellucidum; PFEFFER (93) pp. 109 & 123. *T. rigidum*; SLUITER (111) p. 105.

Trochostoma thomsoni; PFEFFER (93) p. 122. *T. violaceum* (Studer), an Antarctic form found N. of Equator; LUDWIG (70) p. 157.

T. granulatum, E. Central Pacific, 1471–2232 fms. (p. 158); *T. intermedium*, G. of Panama and California, 730–995 fms. (p. 161): LUDWIG (70) Mem. Mus. Harvard, xvii, 3: n. spp.

(C).—ECHINOIDEA.

†*Acrosalenia spinosa*; RICHE (97) p. 75, and (98) p. 219.

Agassizia, discussed; BITTNER (9).

†*Ananchytinarum*, sp. indet., figured; JIMBŌ (49) p. 191.

†*Aniaster*:—*A. confusus*, Pomel, syn. of *A. gibberulus* (p. 703); *A. gibberulus*, priority-squabbles (p. 702); COTTEAU (23).

Arachnoides placenta; BELL (7) p. 412.

†*A. incisa*, Miocene, Gippsland Lakes; TATE (116) T. R. Soc. N. S. W. xxvii, p. 192, n. sp.

†*Arachniopleurus arenatus*; COTTEAU (23) p. 762.

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†*Archæocidaris urii* ? ; TORNQUIST (124) p. 102.

Astropyga radiata ; ANDERSON (3) p. 192.

†*Atelospatangus transilvanicus* ; KOCH (54) p. 280.

†*Botriopygus zumoffeni*, Cretaceous of Lebanon ; COTTEAU (22) C.R. Ass. Franc. 1893, p. 356, n. sp.

Brissopsis distinct from *Toxobrissus* ; BITTNER (9). *B. luzonica*, *B. oldhami* ; ANDERSON (3) p. 195. *B. lyrifera*, abnormality ; MEISSNER & COLLIN (80) p. 344.

B. dollfusi, Middle Eocene, La Hougue near Orglandes (Manche) ; COTTEAU (23) Pal. franc. Eoc. ii, p. 677, n. sp.

†*Caratomus peltiformis* ; HENNIG (42) p. 502.

†*Cardiaster subtrigonatus*, redescribed from Tunis, doubling of posterior ambulacrum ; GAUTHIER (37) p. 34.

†*Cassidaria diadema* ; KOCH (54) p. 229.

†*Cassidulus* :—*C.* sp. ; HENNIG (42) p. 504. *C. testudinarius*, redescribed and figured from Middle Eocene, Fresville (Manche) ; COTTEAU (23) p. 717.

C. casselensis, Middle Eocene, Cassel (Nord) ; COTTEAU (23) Pal. franc. Eoc. ii, p. 720, n. sp.

†*Catopygus rotundus*, *C. minor*, n. sp., Åhussandsten, Sweden ; HENNIG (42) p. 503, n. sp.

Centrostephanus longispinus, first recorded from Tamaris and Toulon ; KOEHLER (56) p. 417.

Cidaris. See also under *Doro-*, *Gonio-*, *Hemi-*, *Leio-*, *Poro-*, *Rhabdo-*, *Stereo-*, *Tylo-*, and *Typo- cidaris*. †*C. armata* ; PARONA (89) p. 55. †*C. asperula*, discussed, includes *C. berthelini*, Cotteau ; LAMBERT (57) p. 42. †*C. bielzi* ; KOCH (54) p. 287. †*C. bowerbanki*, Forbes, referred to *Tylocidaris* ; LAMBERT (57) p. 42. †*C. cenomanensis*, discussed ; *op. cit.*, p. 29. †*C. claviphœnix* ; COTTEAU (22) p. 347. †*C. cucumifera* ; RICHE (98) p. 99. *C. curvatispinis* ; LORIOL (64) p. 60. †*C. dissimilis*, localities in la Marne ; LAMBERT (57) p. 25. †*C. cf. dorsata*, spine only ; BÖSE (11) p. 6. †*C. feliciæ*, redescribed and figured ; COTTEAU (23) p. 756. †*C. gaultina*, spines figured from Albian of Pernes-en-Artois ; LAMBERT (57) p. 17. †*C. gibberula*, Agass., referred to *Tylocidaris* ; *op. cit.*, p. 42. †*C. glandarius* [sic] ; COTTEAU (22) p. 346. †*C. glandifera*, from E. Africa ; FUTTERER (33) p. 35 ; JAEKEL (45) p. 507. †*C. hautevillensis*, Cott., syn. of *C. leptacantha* ; COTTEAU (23) p. 754. †*C. hirudo*, discussed ; LAMBERT (57) p. 29. †*C. leptacantha*, redescribed and figured ; COTTEAU (23) p. 754. †*C. martini* ; PARONA (89) p. 55. †*C. moorei* ; *op. cit.*, p. 56. †*C. perforata*, Roem., probably = *C. gaultina* ; LAMBERT (57) p. 18. †*C. portsesdisensis*, †*C. cf. spileccensis* (p. 287), †*C. subacicularis* (pp. 297, 314), †*C. subularis* (pp. 287, 302, 314) ; KOCH (54). †*C. suleimani*, nom. nud. ; NOETLING (88) p. 126. *C. tribuloides* ; RUSSO (104) p. 160. †*C. uniformis*, spines figured from Albian of Ste-Menehould (p. 18), †*C. velifera*, Schlueter, = *Tylocidaris bowerbanki* (p. 42), †*C. velifera*, Bronn non Schlueter

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(p. 40), †*C. vesiculosa*, Goldfuss, sensu lato, with its various subdivisions discussed in full (pp. 29–40) [see also under *Typocidaris*]; LAMBERT (57). †*C. zschokkei*; RICHE (98) p. 99.

†*C. blaicherei*, Middle Eocene, Mt. Alaric à la Bourdanne (Aude); COTTEAU (23) Pal. franc. Eoc. ii, p. 752. †*C. terrenzii*, Middle Lias, Piedmont and Umbria, spines only; PARONA (89) Mem. Acc. Torino, xliii, p. 54. †*C. trecensis*, Cenomanian, St.-Parres; LAMBERT (57) Bull. Soc. Yonne, xliii, p. 44 : n. spp.

†*Clypeanthus*, n. g., with type *Toxaster pentagonalis*, Fraas, Cretaceous of Lebanon; COTTEAU (22) C.R. Ass. Franc. 1893, p. 354.

†*Clypeaster acuminatus*; KOCH (53) p. 148. †*C. bunopetalus*; REPELIN (95) p. 10. †*C. cranicostatus*, †*C. cf. folium*, †*C. cf. gibbosus*, †*C. herepeyi*; KOCH (53) p. 148. *C. humilis*; ANDERSON (3) p. 194. †*C. petalodes*; BRIVE (16) p. 20. †*C. pyramidalis*; KOCH (53) p. 148. *C. subdepressus*; RUSSO (104) p. 159.

†*Clypeolampas*:—*C. helios*, nom. nud., *C. vishnu*, nom. nud.; NOETLING (88) p. 126. [See also *Echinolampas alienus*.]

†*Clypeus altus*; RICHE (97) p. 68, and (98) p. 193.

Coelopleurus:—*C. cf. delbosi*; KOCH (54) p. 348. *C. equis*; *op. cit.*, pp. 280 & 298.

†*Collyrites*:—*C. analis*; RICHE (97) pp. 68, 71, 72, 75 & 76, and (98) pp. 194, 198, 220, 228 & 239. *C. elliptica*; RICHE (97) pp. 82, 83, 84 & 85, and (98) pp. 287 & 313. *C. ovalis*; RICHE (97) pp. 68 & 71, and (98) pp. 194, 220 & 239. *C. ringens*; RICHE (97) p. 68, and (98) p. 194.

†*Conoclypeus*:—*C. ackneri*; KOCH (54) p. 287. *C. conoideus*; *l. c.*; young individual, very conical, Montfort (Landes); COTTEAU (23) p. 747. *C. marginatus*, conical var.; *l. c.* *C. plagiosomus*; KOCH (53) p. 148.

C. rostratus, Eocene, Table Cape, Tasmania; TATE (116) J. R. Soc. N. S. W. xxvii, p. 194, n. sp.

†*Coptosoma rousseli*; COTTEAU (23) p. 757.

Cyclaster, discussed; BITTNER (9).

†*Cyphosoma*:—*C.* sp.; NOETLING (88) p. 126. *C. colliciare* (p. 23), *C. maresi*, modifications in large individuals (p. 22); GAUTHIER (37).

C. auberti, Santonian, near Dj. M'rilah, Tunis; *op. cit.*, p. 23, n. sp.

†*Diademopsis heretica*, Valenginian, Höllgraben, Switzerland; MAYER-EYMAR (77) Beit. geol. Karte Schweiz. xxiv, pt. ii, p. 1.

†*Diplopodia*:—*D. variolaris*; GAUTHIER (37) p. 15; synonymy; LAMBERT (57) p. 52.

D. sumoffeni, Cretaceous of Lebanon; COTTEAU (22) C.R. Ass. Franc. 1893, p. 348, n. sp.

†*Discoidea* (or *Discoides*):—*D. conicus*; LAMBERT (57) p. 19. *D. cylindrica*; GAUTHIER (37) p. 15; apical system; LAMBERT (57) p. 59. *D. forgemoli*; GAUTHIER (37) p. 14. *D. subuculus*, Klein; LAMBERT (57) p. 58.

†*Ditremaster nux* (Desor), large, elongate var.; COTTEAU (23) p. 708.

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†*Dorocidaris*, discussed ; LAMBERT (57) p. 26 [Species of this genus or subgenus must also be sought under *Cidaris*]. †*D. essenensis*, Schlueter, referred to *Typocidaris*; *op. cit.*, p. 37. *D. papillata* ; MARENZELLER (75) p. 12; RUSSO (104) p. 160 ; synonymy ; KOEHLER (56) p. 417. †*D. subvesiculosa* ; HENNIG (42) p. 501.

D. alcocki, Laccadive Sea, 636 fms. (p. 191); *D. tiara*, Colombo, 142–400 fms., varies in shape with age (p. 188) : ANDERSON (3) J. Asiat. Soc. Bengal, lxiii (ii) : n. spp.

†*Dysaster moeschi*; RICHE (98) p. 313.

†*Echinanthus* :—*E. delbosi*, var. from Eocene of Montfort (Landes) ; COTTEAU (23) p. 727. *E. desmoulinsi*, young specimen ; *op. cit.*, p. 730. *E. griesbachi*, nom. nud. ; NOETLING (88) p. 126. *E. inflatus* ; KOCH (54) p. 302. *E. issyaviensis* ; COTTEAU (23) p. 729. *E. pellati* ; KOCH (54) p. 287. *E. scutella* ; KOCH (53) p. 148, and (54) pp. 280 & 297 ; ROVASENDA (101) p. 418. *E. sopitianus* ; *l. c.*

E. arnaudi, Upper Eocene, Dax (Landes) ; COTTEAU (23) Pal. franc. Eoc. ii, p. 728, n. sp.

†*Echinobrissus* :—*E. amplus* ; RICHE (98) p. 220. *E. angustior* ; GAUTHIER (37) p. 14. *E. clunicularis* ; RICHE (97) pp. 76 & 83, and (98) pp. 220, 228, 239 & 287. *E. djelfensis* ; GAUTHIER (37) p. 21. *E. goybeti*, and allied form ; COTTEAU (22) p. 353. *E. meslei* ; GAUTHIER (37) p. 49. *E. orbicularis* ; RICHE (97) p. 76, and (98) p. 220. *E. pseudominimus* ; GAUTHIER (37) p. 21. *E. sitifensis* ; *op. cit.*, p. 49.

Echinocardium cordatum ; MEISSNER & COLLIN (80) p. 343 ; Mediterranean form distinguished from Atlantic form and from *E. mediterraneum* ; KOEHLER (56) p. 420. *E. flavescens* ; MEISSNER & COLLIN (80) p. 342 ; synonymy ; KOEHLER (56) p. 421.

†*Echinoconus* :—*E. gigas* ; NOETLING (88) p. 126. *E. marginalis* ; GAUTHIER (37) p. 50.

†*Echinocorys* sp. ; GAUTHIER (37) p. 34.

†*Echinocyamus biarritzensis*, redescription and refiguring of type ; COTTEAU (23) Pal. franc. Eoc. ii, p. 749. †*E. dumasi* ; *l. c.* *E. pusillus* ; MEISSNER & COLLIN (80) p. 341 ; synonymy ; KOEHLER (56) p. 420.

†*E. blancheti*, Upper Eocene, Biarritz ; COTTEAU (23) Pal. franc. Eoc. ii, p. 751. *E. crispus* (p. 239), *E. elegans* (p. 240), Red Sea ; MAZZETTI (78) Atti Soc. Modena, xii : n. spp.

Echinodiscus biforis ; ANDERSON (3) p. 194.

†*Echinolampas* :—*E. cf. abbreviatus* ; REPELIN (95) p. 10. *E. affinis* ; COTTEAU (23) p. 746. *E. cf. affinis* ; KOCH (54) p. 297. *E. africanus*, redescribed and figured, from Tunis ; COTTEAU (23) p. 743. *E.* (*Clypeolampas*) *alienus* ; KOCH (54) p. 287. *E. beaumonti* ; COTTEAU (23) p. 745 ; ROVASENDA (101) p. 418. *E. coquandi* ; COTTEAU (23) p. 741. *E. ellipsoidalis* ; *op. cit.*, p. 742. *E. escheri* (pp. 297 & 302), *E. giganteus* (p. 280), *E. cf. globulus* (p. 287) ; KOCH (54). *E. hemisphæricus* ; PAVLOVIC (90) p. 173 ; var. *rodi* ;

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MARTONFI (76) p. 153. *E. laurillardi*; KOCH (53) p. 148. *E. politus*; COTTEAU (23) p. 741. *E. cf. silensis* (p. 280), *E. cf. studeri* (p. 327); KOCH (54). *E. suessii*; ROVASENDA (101) p. 418.

E. bigadanensis, [ascribed to "Cotteau, 1893," but apparently n. sp.], Middle Eocene (Calcaire de St.-Estèphe), Bourdieu near Bégadan (Gironde) (p. 739), *E. dollfusi*, Middle Eocene, Saillancourt near Meulan (Seine-et-Oise) (p. 733), *E. falloti*, Middle and Upper Eocene, Blaye (Gironde) and Biarritz (p. 737), *E. lamberti*, Middle Eocene, Fréville (Manche) (p. 763), *E. rostratus*, Middle Eocene, Liancourt-St.-Pierre (Oise) (p. 731), *E. touzini*, Upper Eocene, Meynieu (Gironde) (p. 735); COTTEAU (23) Pal. franc. Eoc. ii : n. spp.

Echinometra lucunter; ANDERSON (3) p. 193. *E. subangularis* (p. 160), *E. viridis* (p. 159); RUSSO (104).

Echinoneus, diagnosed; COTTEAU (23) p. 712. *E. cyclostomus*; ANDERSON (3) p. 194.

†*E. michaleti*, Upper Eocene, Biarritz; COTTEAU (23) Pal. franc. Eoc. ii, p. 714, n. sp.

†*Echinospatagus*:—*E. africanus* and *E. cordiformis*; GAUTHIER (37) p. 6. *E. dieneri* (Loriol); COTTEAU (22) p. 358.

Echinostrephus molare; ANDERSON (3) p. 193.

Echinothrix desori and *E. turcarum*; RUSSO (104) p. 160.

Echinus acutus; KOEHLER (56) p. 418; breeding season; GARSTANG (36) p. 228; at Cette, distinguished from *E. melo*; KOEHLER (55) p. 7. *E. elegans*; MEISSNER & COLLIN (80) p. 340. *E. esculentus*; PFEFFER (93) p. 117; MEISSNER & COLLIN (80) p. 340; blood; CATTANEO (19) p. 31. *E. melo*; MARENZELLER (75) p. 14; distinguished from *E. acutus* by pedicellaria; KOEHLER (56) p. 418. *E. microtuberculatus*, experiments on ova; SEELIGER (109). *E. miliaris*; MEISSNER & COLLIN (80) p. 340; breeding season; GARSTANG (36) p. 228. *E. norvegicus*, in Mediterranean, distinguished from *E. melo*; MARENZELLER (75) p. 13.

†*Enallopneustes* discussed with figures of *E. jullieni* and *E. meslei*; GAUTHIER (37) p. 45.

†*Enallaster*:—*E. delgadoi* (p. 357), *E. syriacus* (p. 358); COTTEAU (22). *E. tissoti*; GAUTHIER (37) p. 7.

†*Epiaster*:—*E.* sp. indet.; *l. c.* *E. crassissimus* (p. 72), *E. distinctus*, discussed (p. 67); LAMBERT (57). *E. hemiasterinus*, maintained; CRAGIN (24) p. 45. *E. restrictus*; GAUTHIER (37) p. 7. *E. trigonalis*; LAMBERT (57) p. 68.

E. matronensis, Upper Cenomanian, Vitry-le-François; LAMBERT (57) Bull. Soc. Yonne, xliii, p. 69, n. sp.

†*Euspatangus*:—*E. crassus* and *E. elongatus* (p. 280), *E. cf. elongatus* (p. 298), *E. haynaldi* (p. 228), *E. pavayi* (pp. 298, 327 & 348); KOCH (54).

Fibularia ovulum (p. 193), *F. volva* (p. 194); ANDERSON (3).

Gagaria, Duncan, and all spp. thereof syn. of *Orthechinus*, Gauthier; COTTEAU (23) p. 758.

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†*Galerites* sp., 4- and 6-rayed ; LAUR (61) p. 6.

†*Galerolampas sorigneti* ; COTTEAU (23) p. 730.

†*Glyphocyphus radiatus*, synonymy discussed, variations in apical system, description of ambulacra ; LAMBERT (57) p. 53.

†*Glypticus sulcatus*, Sequanian, Nantua ; LORIOL (65) p. 468.

Goniocidaris, discussed ; LAMBERT (57) p. 28 [Species of this genus or subgenus must also be sought under *Cidaris*].

†*Goniopygus, cf. menardi* ; COTTEAU (22) p. 353.

†*Gualteria heberti* ; COTTEAU (23) p. 674.

†*Hebertia parisensis*, traces of colour; COTTEAU (23) p. 762.

†*Hemiaster* :—*H. ameliæ*, details of ambulacra ; GAUTHIER (37) p. 9. *H. asterias*, two species under this name ; LAMBERT (57) p. 23. *H. auberti* (p. 25), *H. aumalensis* (p. 8), *H. batnensis* (p. 12) ; GAUTHIER (37). *H. blanfordis*, nom. nud. ; NOETLING (88) p. 126. *H. bourguignati* ; GAUTHIER (37) p. 12. *H. bufo* ; BOURGEAT (13) p. 357 ; LAMBERT (57) p. 72. *H. calvini*, Clark, referred to *Epiaster hemiasterinus* ; CRAGIN (24) p. 45. *H. fourneli* ; GAUTHIER (37) pp. 18 & 25. *H. griepenkerti* ; LAMBERT (57) p. 73. *H. heberti* (p. 11), *H. latigrunda* (p. 18) ; GAUTHIER (37). *H. luynesi* ; COTTEAU (22) p. 360. *H. minimus* ; BOURGEAT (13) p. 356. *H. nux* ; KOCH (54) pp. 280, 297 & 314. *H. oblique-truncatus* ; GAUTHIER (37) p. 17. *H. oldhami*, nom. nud. ; NOETLING (88) p. 126. *H. ricordeanus* ; BOURGEAT (13) p. 356 ; d'Orb., name rectified to *H. ricordeaui* [without reason given], and species distinguished from *Epiaster ricordeaui*, Cotteau ; LAMBERT (57) p. 22.

H. cossignyi, Lower Albian, Courcelles-sur-Seine (Aube) ; LAMBERT (57) Bull. Soc. Yonne, xlviii, p. 21. *H. icaunensis*, Cenomanian, Seignelay, stages of growth, and figures of ambulacra and apical system ; *op. cit.*, p. 73. *H. subverrucosus*, Senonian, Sidi-Mahomed-el-Nauli, S.E. of Tunis ; GAUTHIER (37) p. 26 : n. spp.

†*Hemicidaris herbichi* ; KOCH (54) p. 314.

†*Hemipedina* :—*H. charltoni*, Choctaw Limestone, Texas ; CRAGIN (25) Colorado Coll. Studies, v, p. 50. *H. libanotica*, Cenomanian of Lebanon ; COTTEAU (22) C.R. Ass. Franc. 1893, p. 350 : n. spp.

†*Hemipneustes*:—*H. compressus*, nom. nud., *H. leymeriei*, and *H. pyrenaicus* ; NOETLING (88) p. 126.

†*Hemipygus rochati*, Rhodanian, Perte du Rhône ; LORIOL (65) Rev. Suisse Zool. iv, p. 469, n. sp.

†*Heterodiadema libycum* ; GAUTHIER (37) p. 15.

†*Holaster* :—*H. lævis* ; BOURGEAT (13) p. 357 ; distinguished from *H. nodulosus*, at least as a mutation (p. 20), *H. latissimus* (p. 19), *H. nodulosus*, synonymy and localities (p. 60), *H. subglobosus* (p. 61), *H. trecensis*, maintained distinct from *H. nodulosus* (p. 63); LAMBERT (57).

†*Holectypus* :—*H. baluchistanensis*, nom. nud. ; NOETLING (88) p. 126. *H. depressus* ; RICHE (97) pp. 68, 71, 72, 75, 76, 82, 83 & 84, and (98) pp. 193, 198, 219, 239, 286 & 313. *H. punctulatus* ; RICHE

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(97) pp. 82 & 83, and (98) pp. 286 & 313. *H. serialis*; GAUTHIER (37) p. 21.

H. charltoni, Choctaw Limestone, Texas; CRAGIN (24) Colorado Coll. Studies, v, p. 41, footnote, n. sp. [?]

†*Homoeaster*, discussed (p. 44), *H. tunetanus*, redescribed and figured (p. 45); GAUTHIER (37).

H. discrepans, Senonian, Djebel Ahmar, Tunis; GAUTHIER (37) p. 48, n. sp.

†*Hyboclypeus gibberulus*; RICHE (97) pp. 68, 71 & 76, and (98) pp. 193, 220 & 287.

†*Hypeaster*, discussed; COTTEAU (22) p. 359. *H. vatonnei*; genus discussed; GAUTHIER (37) p. 8.

†*Hypsospatangus lefebvrei* (Lor.), redescribed from Tunis; COTTEAU (23) p. 676.

Laganum decagonale, young forms probably include *L. orbiculare*; BELL (7) p. 411. *L. depressum*; ANDERSON (3) p. 194. †*L. transilvanicum*; KOCH (54) p. 297.

L. delicatum, Red Sea, the name supersedes the nom. nud. *L. fragile*; MAZZETTI (78) Atti Soc. Modena, xii, p. 241. *L. platymodes*, Miocene, E. of St. Vincent Gulf, S. Australia; TATE (116) T. R. Soc. N. S. W. xxvii, p. 193 : n. spp.

†*Lambertiaster*, n. g., with type *L. douvillei*, Upper Senonian, Djebel Eïdous, Tunis (p. 28), *L. auberti*, Senonian, Djebel Ahmar, N. of Tunis (p. 32); GAUTHIER (37) : n. spp.

†*Leiocidaris itala*; KOCH (54) pp. 297 & 314.

†*Leiopedina samusi*; KOCH (54) p. 280.

Leucaster, validity of; BITTNER (9).

†*Linthia arthonensis*, redescribed and figured (p. 689), †*L. leymeriei*, redescribed and figured (p. 686), †*L. orbignyi*, large var. (p. 681); COTTEAU (23). †*L. payeni*; GAUTHIER (37) p. 28. †*L. subglobosa*, depressed form (p. 678), †*L. vilanovæ*, redescribed from Aude (p. 684); COTTEAU (23).

†*L. assabensis*, Red Sea; MAZZETTI (78) Atti Soc. Modena, xii, p. 242. †*L. bergeroni*, [ascribed to "Cotteau, 1893," but apparently n. sp.], Middle Eocene, Montagne d'Alaric (Aude); COTTEAU (23) Pal. franc. Eoc. ii, p. 681. †*L. gillioti*, Middle Eocene, Rigni, near Montlaur (Aude); *op. cit.*, p. 679. †*L. savini*, Middle Eocene, Aude; *op. cit.*, p. 687 : n. spp.

Lovenia elongata; ANDERSON (3) p. 195.

†*Macropneustes hofmanni*; KOCH (54) pp. 280 & 298.

Maretia alta, yellow var., and *M. planulata*; ANDERSON (3) p. 195.

Metalia sternalis; ANDERSON (3) p. 195.

†*Micraster* :—*M. brevis*; GAUTHIER (37) p. 19. *M. normanniæ*; FORTIN (31).

Miotoxaster rejected; COTTEAU (22) p. 359.

†*Opissaster*:—*O. thagastensis*, redescribed and figured (p. 706), *O. thebensis* (Lor.), redescribed and figured from Tunis (p. 704); COTTEAU (23).

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†*Oriolampas rousseli*, Middle Eocene, Conques, Montagne Noire (Aude); COTTEAU (23) Pal. franc. Eoc. ii, p. 715, n. sp.

†*Orthechinus*, Gauthier, preferred to *Gaguria*, Duncan, and *O. pegoti*, var. from near Carcassonne (p. 758), *O. tunetanus*, redescribed and figured; COTTEAU (23) Pal. franc. Eoc. ii, p. 759.

†*Orthopsis*:—*O. miliaris*; GAUTHIER (37) p. 21. *O. perlata*, nom. nud.; NOETLING (88) p. 126.

O. zumoffeni, Cretaceous of Lebanon; COTTEAU (22) C.R. Ass. Franc. 1893, p. 352, n. sp.

†*Ovulaster*, discussed, and *O. zignoanus*, redescribed; GAUTHIER (37) p. 40.

O. auberti, Senonian, Djebel Ahmar, Tunis; GAUTHIER (37) p. 42, n. sp.

†*Palæchinus elegans*, and †*P. ellipticus* ?; TORNQUIST (124) pp. 100 & 103.

Parabrissus, discussed; BITTNER (9).

†*Parapygus cassiduloides*; GAUTHIER (37) p. 49.

†*Pedinopsis torrendi*, Cenomanian of Lebanon; COTTEAU (22) C.R. Ass. Franc. 1893, p. 351, n. sp.

†*Peltastes*:—*P. clathratus*; LAMBERT (57) p. 44.

P. favrei, Cretaceous, Kislovosk (Caucasus); LORIOL (65) Rev. Suisse Zool. iv, p. 471, n. sp.

†*Periaster*:—*P. charmesi* (p. 18), *P. fischeri* (p. 13); GAUTHIER (37). *P. (vel Linthia) kochi*; KOCH (53) p. 147.

P. thalensis, Turonian (?), N. of Thala, Tunis; GAUTHIER (37) p. 16, n. sp.

†*Pericosmus*:—*P. nicaisei*, redescribed and figured; COTTEAU (23) p. 709.

P. elongatus, Eocene, Nousse (Landes); COTTEAU (23) Pal. franc. Eoc. ii, p. 711, n. sp.

†*Perischodomus magnus*, Devonian, Cornwall and Elsass, based on Phillips' fig. of *Adelocrinus hystrix*, Pal. foss. Cornwall, pl. xvi, fig. 42; TORNQUIST (124) Mt. geol. Landesanst. Elsass, iv, p. 103, n. sp.

Phormosoma bursarium and *P. luculentum*; ANDERSON (3) p. 192.

Phyllacanthus annulifera; ANDERSON (3) p. 188.

†*Phymosoma* sp.; HENNIG (42) p. 502.

†*Plesiaster*, discussed; BITTNER (9). *P. cotteaui* (p. 28), *P. peini* (p. 20); GAUTHIER (37).

†*Pliolampas gourdoni*; COTTEAU (23) p. 748.

†*Polydiadema tenue*; LAMBERT (57) p. 51.

†*Porocidaris pseudoserrata*; COTTEAU (23) p. 757; KOCH (54) pp. 287 & 298.

†*Poropeltaris sculptopunctata*, redescribed; LORIOL (65) p. 472.

Pourtalesia jeffreysii; PFEFFER (93) pp. 101 & 117.

†*Prenaster*, discussed; BITTNER (9). *P. alpinus*; KOCH (54) p. 280.

†*Protechinus paucituberculatus*, nom. nud; NOETLING (88) p. 126.

†*Psammechinus duciei*; KOCH (53) p. 148. †*P. gravesi*; KOCH (54) p. 228. *P. microtuberculatus*; KOEHLER (56) p. 418; at Cette; KOEHLER (55) pp. 4 & 7. †*P. monilis*; KOCH (53) p. 147. †*P. cf. monilis*; MARTONFI (76) p. 153.

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†*Pseudodiadema* :—*P. albense*, Albian of l'Yonne (p. 19), *P. schluteri*, Lor., referred to *Tiaromma* (p. 51) ; LAMBERT (57).

P. libanoticum, Cenomanian of Lebanon ; COTTEAU (22) C.R. Ass. Franc. 1893, p. 347, n. sp.

†*Pygorhynchus* :—*P. desnoyersi* (p. 722), a marked var. from Fréville (Manche) (p. 764), *P. grignonensis*, remarkable var., from Venable (Eure) (p. 721), *P. gregoirei*, specimens from Cambon (Loire-Inférieure) approaching *P. grignonensis* (p. 722); COTTEAU (23).

P. barroisi, Middle Eocene, Monze, Montagne d'Alaric (Aude) (p. 723), *P. savini*, Middle Eocene, Barroubio, near St. Chinan (Hérault) (p. 725); COTTEAU (23) Pal. franc. Eoc. ii : n. spp.

†*Pygurus depressus* ; RICHE (97) pp. 68, 71, 76 & 83, and (98) pp. 193, 219, 239 & 287.

†*Pyrina* :—*P.* sp. indet, Cretaceous, Ghazin ; COTTEAU (22) p. 354. *P. ataxensis* ; NOETLING (88) p. 126. *P. bleicheri* ; GAUTHIER (37) p. 49. *P. gigantea*, nom. nud. ; NOETLING (88) p. 126.

†*Rachiosoma peroni* ; GAUTHIER (37) p. 25.

†*Rhabdocidaris* :—*R.* sp. ; BOTTO-MICCA (12) p. 193. *R. horrida* ; RICHE (98) p. 71.

†*Rhynchopygus marmini* ; HENNIG (42) p. 504.

†*Runa desori* ; ROVASENDA (101) p. 418.

†*Salenia* :—*S. areolata* ; HENNIG (42) p. 501. *S. austeni*, Forbes in Woodward, rediagnosed, Cenomanian, Seignelay (Yonne) ; LAMBERT (57) p. 44. *S. fraasi* ; COTTEAU (22) p. 353. *S. nutrix* ; GAUTHIER (37) p. 50. *S. petalifera*, discussed ; LAMBERT (57) pp. 46 & 47.

S. colleti, Cenomanian, Givry-en-Argonne ; LAMBERT (57) Bull. Soc. Yonne, xliii, p. 47, n. sp.

Salmacis dussumieri and *S. sulcata* ; ANDERSON (3) p. 193.

S. rufa, Macclesfield Bank, 30–44 fms. ; BELL (7) P. Zool. Soc. London, 1894, p. 411, n. sp.

†*Schizaster africanus*, redescribed and figured from Tunis ; COTTEAU (23) p. 697. †*S. ambulacrum* (p. 298), †*S. archiaci* (p. 280) ; KOCH (54) ; COTTEAU (23) p. 691. *S. canaliferus* ; KOEHLER (56) p. 421 ; at Cette ; KOEHLER (55) p. 7. †*S. dumasi*, redescribed and figured ; COTTEAU (23) p. 694. *S. gibberulus* ; ANDERSON (3) p. 194. †*S. cf. karreri* ; KOCH (53) p. 148. †*S. leymeriei*, inflated var. from St.-Vallier-de-Thiey ; COTTEAU (23) p. 702. †*S. lucidus* ; KOCH (54) pp. 298 & 314. †*S. rousseli*, var. from Ariège (p. 694), †*S. thebensis*, Lor., referred to *Opissaster* (p. 704) ; COTTEAU (23). †*S. vicinalis* ; KOCH (54) pp. 280 & 298.

†*S. julieni*, Eocene, Grignon (Seine-et-Oise) (p. 629), †*S. trozzensis*, [ascribed to "Gauthier, 1894," but apparently n. sp.], Middle Eocene, Djebel Trozza in Tunis (p. 700) ; COTTEAU (23) Pal. franc. Eoc. ii : n. spp.

†*Scutellina* :—*S. lenticularis* ; COTTEAU (23) p. 748. *S. nummularia* ; KOCH (54) p. 241. *S. obovata* ; COTTEAU (23) p. 748. *S. rotunda* ; KOCH (54) p. 280.

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†*Scutella* :—*S. subtrigona* ; KOCH (54) p. 348. *S. vindobonensis* ; KOCH (53) p. 148 ; MARTONFI (76) p. 153.

†*Sismondia* :—*S. occitana* (pp. 228 & 287), *S. rosacea* (pp. 297 & 302) ; KOCH (54).

S. murravica, Eocene, R. Murray Cliffs ; TATE (116) T. R. Soc. N. S. W. xxvii, p. 193, n. sp.

Solaster papposus, Forbes, poison ; LINSTOW (62) p. 136.

Sphærechinus granularis, synonymy ; KOEHLER (56) p. 419 ; experiments on ova ; SEELIGER (109).

S. roseus, G. of Naples, 30–100 metres: RUSSO (105), Atti Acc. Napoli, vi, No. 1, p. 8, n. sp.

†*Spatangus austriacus* ; KOCH (53) pp. 148 & 152. †*S. murchisoni*, Mantell, referred to *Epiaster* ; LAMBERT (57) p. 71. †*S. purpureus* ; MEISSNER & COLLIN (80) p. 343 ; KOEHLER (56) p. 420 ; MARENZELLER (75) p. 15.

†*Stenonia*, discussed (p. 37), *S. tuberculata*, redescribed and figured from Tunis (p. 38) ; GAUTHIER (37).

Stereocidaris, discussed ; LAMBERT (57) p. 28 [Species of this genus or subgenus or sub-subgenus must also be sought under *Cidaris* and *Typocidaris*].

†*Stirechinus minimus*, Bartonian, Gassino ; ROVASENDA (101) p. 418.

†*Stomechinus bigranularis* ; RICHE (97) p. 68, and (98) p. 193.

Stomopneustes variolaris ; ANDERSON (3) p. 193.

Strongylocentrotus drobachiensis ; COOPER (21) p. 32 ; PFEFFER (94) pp. 98, 101 & 117 ; MEISSNER & COLLIN (80) p. 341 ; var. with enormous pedicellariæ, Davis Str. ; RODGER (99) p. 163. *S. lividus*, competition with *Sphærechinus* ; KOEHLER (56) p. 419 ; poison ; LINSTOW (62) p. 135 ; blood ; CATTANEO (19) p. 31 ; at Cette ; KOEHLER (55) p. 4.

†*Temnechinus* :—*T. macleayi*, Ten.-Woods, either a *Paradoxechinus* or a *Psammechinus* ; TATE (117).

T. scillæ, Red Sea ; MAZZETTI (78) Atti Soc. Modena, xii, p. 238, n. sp.

Temnopleurus bothryoides, probably includes *Pleurechinus variabilis* and *P. ruber*, Doed. ; BELL (7) p. 410. *T. reynaudi* ; *l. c.* *T. toreumaticus* ; ANDERSON (3) p. 192.

Tiarella, Pomel *pars*, referred to *Tiaromma* ; LAMBERT (57) p. 49.

†*Tiaromma*, discussed (p. 49), *T. schluteri* (p. 51) ; LAMBERT (57).

†*Toxaster* :—*T. dieneri*, Loriol, referred to *Echinospatangus* ; COTTEAU (22) p. 358. *T. pentagonalis*, see *Clypeanthus*.

†*Toxobrissus*, distinct from *Brissopsis* ; BITTNER (9). *T. cf. crescenticus* ; KOCH (53) p. 147. *T. lorioli* ; KOCH (54) p. 280.

Toxopneustes lividus, see *Strongylocentrotus*.

Tripneustes gratilla, young ; BELL (7) p. 411.

†*Tylocidaris bowerbanki* (Forbes) ; LAMBERT (57) p. 42.

†*Typocidaris*, discussed ; LAMBERT (57) p. 26 [Species of this genus or subgenus must also be sought under *Cidaris*]. *T. essenensis*, discussed ; *op. cit.*, pp. 30 & 37. *T. vesiculosa*, s. str., fully discussed ; *op. cit.*, pp. 29 & 36.

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T. proshirudo, Upper Cenomanian, Neuvy-Sautour (Yonne) and St.-Parres (Aube); LAMBERT (57) Bull. Soc. Yonne, xliii, pp. 30 & 38, n. sp.

(D.)—ASTEROIDEA.

Classification of *Asteroidea* discussed, following proposed:—Order, Forcipulata (Brisingidæ, Pedicellasteridæ, Heliasteridæ, Asteridæ, Zoroasteridæ, Stichasteridæ); Order, Spinulosa (Echinasteridæ, Mithrodidæ, Solasteridæ, Asterinidæ, Ganeriidæ); Order, Velata (Myxasteridæ, Pythonasteridæ, Pterasteridæ); Order, Paxillosa (Astropectinidæ, Porcellanasteridæ, Archasteridæ); Order, Valvata (Linckiidæ, Pentagonasteridæ, Gymnasteridæ, Antheneidæ, Pentacerotidæ); PERRIER (92). Classification into Suborders, Families, and Genera, with special reference to fossils; STÜRTZ (115) pp. 38–86.

Acantharchaster, n. g., type *A. dawsoni* (olim *Archaster*); VERRILL (125) P. U. S. Mus. xvii, p. 268.

Anthenoides sarissa, figured; ALCOCK (2)

Aphroditaster, Sladen, rejected; PERRIER (92) p. 341.

Archaster americanus, Verrill, referred to *Astropecten* (p. 255), *A. bairdi*, type of n. g. *Isaster* (p. 258), *A. dawsoni*, type of n. g. *Acantharchaster* (p. 268); VERRILL (125). *A. echinulatus*, Perrier, referred to *Cheiraster* (p. 278), *A. efflorescens*, Perrier, referred to *Plutonaster* (p. 322); PERRIER (92). *A. floræ*, Verrill, referred to *Psilaster* (p. 255), *A. formosus*, Verrill, referred to *Paragonaster* (p. 257); VERRILL (125). *A. insignis*, Perrier, referred to *Dytaster*; PERRIER (92) p. 299. *A. mirabilis*, Perr., referred to *Cheiraster coronatus*, *C. vincenti*, *C. mirabilis*, and *Pontaster oligoporus*, quos vide; *op. cit.* *A. parelii*, Verrill, non D. & K., syn. of *Pseudarchaster intermedius*; VERRILL (125) p. 249. *A. pulcher*, Perrier, referred to *Plutonaster* (p. 322), *A. rigidus*, Perrier nom. nud. in Filhol, referred to *Dytaster* (p. 304); PERRIER (92). *A. sepitus*, referred to *Pontaster*; VERRILL (125) p. 247. *A. simplex*, Perrier, referred to *Pararchaster*; PERRIER (92) p. 254. *A. tenuispinus*, Verrill non auctt., referred to *Pontaster hebitus* and *P. forcipatus*; VERRILL (125) p. 247. *A. typicus*, variation in spines; BELL (7) p. 402.

A. tenuis, Macclesfield Bank, 35 fms.; BELL (7) P. Zool. Soc. London, 1894, p. 402, n. sp.

Archasteridæ, discussed, diagnosed, key to subfamilies and genera; PERRIER (92) pp. 237–252; limits discussed; VERRILL (125) p. 266.

†*Archasterias rhenana*, discussed; STÜRTZ (115) pp. 42 & 58.

Aspidosoma, discussed; STÜRTZ (115) pp. 38 & 55.

†*Asterias acuminatus*, Sim., possibly a *Ræmeraster*; STÜRTZ (115) p. 53. *A. glacialis*; MEISSNER & COLLIN (80) p. 338; littoral and deep-water varieties; KOEHLER (56) p. 407; senses of smell and taste; NAGEL (86) p. 177; at Cette, distinction between littoral and deep-sea types; KOEHLER (55) pp. 4 & 6. *A. grœnlandica* (pp. 105 &

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119), *A. gunneri* (pp. 106 & 120); PFEFFER (93). *A. muelleri*; MEISSNER & COLLIN (80) p. 338. *A. panopla*; PFEFFER (93) p. 120. *A. richardi*, redescribed and figured, 6-armed young, by fission, produce 5-armed adult; MARENZELLER (75) p. 8. *A. rubens*, variations; MEISSNER & COLLIN (80) p. 338; breeding season; GARSTANG (36) p. 228. *A. stellionura*; PFEFFER (93) p. 120. *A. tenuispina*, schizogony in young not in adult; KOEHLER (56) p. 408. *A. vosellata*; BELL (7) p. 405.

Asteriidæ, discussed, diagnosed, key to genera; PERRIER (92) p. 105.

Asterina cephea; RUSSO (104) p. 162. *A. gibbosa*, organogeny; MACBRIDE (72); variation in larva; MACBRIDE (74); oviposition; SCHERREN (108); breeding season; GARSTANG (36) p. 228; at Cette; KOEHLER (55) p. 4; synonymy, includes *A. panceri* (Gasco); KOEHLER (56) p. 408.

Astrella simplex, redescribed and figured, possibly a young *Luidia*; PERRIER (92) p. 193.

Astrogonium, diagnosed, structure of ventral surface, distribution of species (p. 338), *A. aphrodite*, discussed (p. 354), *A. elongatum*, Perrier, referred to *Paragonaster* (p. 362), *A. fallax*, redescribed and figured, with n. var. *africanus*, N. of Banc d'Arguin (p. 347); PERRIER (92).

A. annectens, Gulf of Gascony, 900 metres (p. 343), *A. hystrix*, coast of Morocco, 840 metres (p. 345), *A. necator*, Azores, 1257 metres (p. 350); PERRIER (92) : n. spp.

Astropecten americanus; VERRILL (125) p. 255. *A. aurantiacus*; KOEHLER (56) p. 409; at Cette; KOEHLER (55) p. 6. *A. bispinosus*; KOEHLER (56) p. 409; at Cette; KOEHLER (55) p. 6. *A. irregularis*, variation; MEISSNER & COLLIN (80) p. 337. *A. pentacanthus*; MARENZELLER (75) p. 3; at Cette; KOEHLER (55) p. 6. †*A. poritoides*; ROVASENDA (101) p. 418. †*A. schlueteri*, discussed; STÜRTZ (115) pp. 51 & 71. *A. spinulosus*; KOEHLER (56) p. 410. *A. squamatus*, variation; *l. c.* *A. tenuispinis*, far north; RODGER (99) p. 161.

†*A. carroni*, Bajocian, Allonal, near St. Amour, Jura; LORIOL (65) Rev. Suisse Zool. iv, p. 474. *A. ibericus*, B. of Cadiz, C. Blanc, 99–120 metres; PERRIER (92) p. 196 : n. spp.

Astropectinidæ, limits discussed; VERRILL (125) p. 266; discussed, divided into *Luidinæ* and *Astropectininæ*; PERRIER (92) p. 193.

Bathybiaster pallidus; PFEFFER (93) p. 117. *B. robustus*, young = *Phoxaster pumilus*; VERRILL (125) p. 256.

Bdellacoma, discussed; STÜRTZ (115) pp. 46 & 63.

Benthopecten, systematic position; VERRILL (125) p. 268. *B. spinosus*, includes *Pararchaster armatus* and *P. semisquamatus*, var. *occidentalis*, variations and 4-rayed form described; *op. cit.*, p. 245.

Benthopectininæ, new subfam.; *l. c.*

Brisinga, diagnosed, distribution of species; PERRIER (92) pp. 61 & 62. *B. americana*, Verrill, referred to *Odinia*; VERRILL (125) p. 279.

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B. coronata, discussed ; PERRIER (92) p. 68 ; var. in E. Mediterranean ; MARENZELLER (75) p. 10. *B. costata*, redescribed; VERRILL (125) p. 280. *B. elegans*,Verrill, referred to *Freyella*; *op. cit.*, p. 283. *B. elegans*, Perrier, referred to *Odinia* ; PERRIER (92) p. 71. *B. endecacnemos*, redescribed and figured, variations from type correlated with distribution (p. 62), *B. mediterranea*, discussed (p. 70), *B. robusta*, Perrier, referred to *Odinia* (p. 78), *B. semicoronata*, Perrier, referred to *Odinia* (p. 75); PERRIER (92). *B. verticillata* ; VERRILL (25) p. 283.

B. hirsuta, from Norway to Banc d'Arguin, 2030 metres ; PERRIER (92) p. 66. *B. multicostata*, George's Bank and Martha's Vineyard, 1742 & 1137 fms.; VERRILL (125) P. U. S. Mus. xvii, p. 280 : n. spp.

Brisingidæ, discussed, morphology of skeleton, diagnosis and key to genera ; PERRIER (92) pp. 43–61.

Caulaster, maintained and diagnosed (p. 203), *C. pedunculatus*, redescribed and figured (p. 204); PERRIER (92).

C. sladeni, coast of Morocco, 1435 metres ; PERRIER (92) p. 208, n. sp.

Chaetaster longipes, Atlantic, 1100 metres ; PERRIER (92) p. 329.

C. moorei, Macclesfield Bank, 30–40 fms.; BELL (7) P. Zool. Soc. London, 1894, p. 404, n. sp.

Cheiraster, Stüder, emend. Perrier, described, distribution of species (p. 269), *C. coronatus*, redescribed (p. 271), *C. echinulatus* (p. 278), *C. folini*, Perrier, referred to *Pararchaster* (p. 256), *C. mirabilis*, redescribed (p. 276), *C. vincenti*, discussed (p. 275); PERRIER (92).

Cheiropteraster, redescribed ; STÜRTZ (115) pp. 49 & 68.

Coronaster, diagnosed, distribution of species ; PERRIER (92) p. 92.

C. antonii, coast of Morocco, 717 metres (p. 96), *C. parfaiti*, C. Verde Is., 250 metres (p. 93); PERRIER (92) : n. spp.

Crenaster marionis, referred to *Pontaster* (p. 290), *C. mollis*, redescribed and figured (p. 310); PERRIER (92).

C. semispinosus, 5000 metres (p. 307), and *C. spinulosus*, 4255 metres (p. 309), Gulf of Gascony ; PERRIER (92) : n. spp.

Cribrella, referred to *Echinaster* ; RUSSO (105) p. 4; diagnosed, distribution of species; PERRIER (92) p. 143. *C. oculata*; PFEFFER (93) pp. 105 & 119; compared with *Echinaster sepositus*; RUSSO (105) p. 3.

C. abyssalis, coast of Morocco, 1105 metres ; PERRIER (92) p. 144. *C. pectinata*, Eastport, Me., "shallow water"; VERRILL (125) P. U. S. Mus. xvii, p. 278 : n. spp.

Crossaster affinis ; PFEFFER (93) pp. 103 & 118. *C. papposus* ; MEISSNER & COLLIN (80) p. 339; PFEFFER (94) pp. 98 & 118.

C. helianthus, George's Bank, "deep water"; VERRILL (125) P. U. S. Mus. xvii, p. 274, n. sp.

Cryptaster, n. g., with type *C. personatus*, Azores, 2995 metres ; PERRIER (92) p. 191, n. sp.

Ctenaster, diagnosed (p. 154), *C. spectabilis*, redescribed (p. 155); PERRIER (92).

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Clenodiscus corniculatus, Linck. ; PFEFFER (94) p. 98 ; (= *C. crispatus*, Retz.) ; PFEFFER (93) pp. 102 & 117.

Culcita sp., brephic stage figured ; BELL (7) p. 403. *C. coriacea* ; RUSSO (104) p. 162.

Dipsacaster pentagonalis, figured ; ALCOCK (2).

Dorigona, diagnosed, note on young individuals, sp. indet. (p. 365), *D. arenata*, redescribed and figured (p. 379), *D. subspinosa*, redescribed (p. 375), *D. ternalis*, redescribed (p. 371) ; PERRIER (92).

D. jacqueti, Canaries, C. Spartel, &c., 550–1238 metres ; PERRIER (92) p. 383, n. sp.

Dytaster, diagnosed, distribution of species ; PERRIER (92) p. 298. *D. anacanthus*, figured ; ALCOCK (2). *D. grandis*, young, and 4-rayed ; VERRILL (125) p. 248. *D. insignis*, redescribed ; PERRIER (92) p. 299. *D. madreporifer*, Sladen, is young of *D. grandis* ; VERRILL (125) p. 248.

D. agassizii, 4060 metres (p. 302), and *D. rigidus*, 4787–5005 metres (p. 304), near Azores ; PERRIER (92) : n. spp.

Echinaster, diagnosed, distribution of species ; PERRIER (92) p. 146 ; generic characters discussed ; RUSSO (105) p. 2. *E. sepositus*, description of young ; PERRIER (92) p. 148 ; sense of smell and taste ; NAGEL (86) p. 177 ; at Naples ; RUSSO (105) p. 2 ; at Cette ; KOEHLER (55) p. 6 ; littoral and deep-water varieties ; KOEHLER (56) p. 408.

E. sladeni, Mauritius ; LORIOL (64) Mem. Soc. Geneve, xxxii (1), p. 61, n. sp.

Echinasterella, discussed ; STÜRTZ (115) pp. 53 & 73.

Echinasteridæ, discussed, with key to subfamilies and genera ; PERRIER (92) p. 141.

Forcipulata, key to families ; PERRIER (92) p. 42.

Freyella, diagnosed, distribution of species ; PERRIER (92) p. 81. *F. americana*, Sladen, referred to *Odinia* ; VERRILL (125) p. 279. *F. bractiata*, Sladen, syn. of *F. elegans* ; *op. cit.*, p. 283. *F. edwardsi*, redescribed and figured ; PERRIER (92) p. 82. *F. elegans* (olim *Brisinga*), redescribed ; VERRILL (125) p. 283. *F. sexradiata*, redescribed and figured ; PERRIER (92) p. 89. *F. spinosa*, n. var. *abyssicola*, N.E. of Azores, 4060 metres ; *op. cit.*, p. 85.

F. aspera, Chesapeake Bay, 1917 fms. (p. 285), *F. microspina*, Martha's Vineyard, 1054 fms. (p. 286) ; VERRILL (125) P. U. S. Mus. xvii. *F. spinosa*, Soudan, 2300 metres ; PERRIER (92) p. 85 : n. sp.

Fromia narcissiæ, C. Verde Is., 75 metres, perhaps young *Narcissia* ; PERRIER (92) p. 331, n. sp.

Ganeriidæ, discussed, diagnosed, key to genera ; PERRIER (92) p. 171.

Gastraster, n. g., with type *G. margaritaceus* (olim *Pedicellaster*) ; PERRIER (92) p. 103.

Gnathaster, discussed ; VERRILL (125) p. 262.

G. mediterraneus, W. of Milo, 834 metres ; MARENZELLER (75) Denk. Ak. Wien, lx (v), p. 6, n. sp.

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†*Goniaster impressæ* ; RICHE (97) p. 98, and (98) p. 352.

Goniopecten, diagnosed ; PERRIER (92) p. 294 ; restricted ; VERRILL (125) p. 249. *G. demonstrans*, redescribed (p. 295), *G. edwardsi*, Perrier, referred to *Plutonaster* (p. 314), *G. inermis*, Perrier, referred to *Plutonaster* (p. 319), *G. intermedius*, Perrier, referred to *Plutonaster* (p. 316), *G. subtilis*, Perrier, referred to *Paragonaster* (p. 358) ; PERRIER (92).

Hoplaster, diagnosed (p. 323), *H. spinosus*, redescribed (p. 324); PERRIER (92).

Hydrasterias ophidion, "structural characters appear worthy of generic rank" ; VERRILL (125) p. 279.

H. richardi, off Corsica and C. Verde Is., 540 & 225 metres ; PERRIER (92) p. 109, n. sp.

Hymenaster, diagnosed, distribution of species; PERRIER (92) p. 183. *H. modestus*, redescribed ; VERRILL (125) p. 277. *H. pellucidus* ; PFEFFER (93) pp. 105 & 119.

H. giboryi, N.E. of Azores, 4060 metres (p. 189), *H. rex*, coast of Senegal, 1139–2285 metres (p. 186); PERRIER (92) : n. spp.

Hyphalaster, diagnosed, distribution of species ; PERRIER (92) p. 227.

H. antonii, Azores, 2995 metres (p. 232), *H. parfaiti*, G. of Gascony, 4787 metres (p. 229) ; PERRIER (92) : n. spp.

Isaster, n. g., with type *I. bairdii* (olim *Archaster*), variations and 6-rayed ; VERRILL (125) P. U. S. Mus. xvii, p. 257.

Korethraster, diagnosed, distribution of species ; PERRIER (92) p. 159.

K. setosus, Gulf of Gascony, 392–1226 metres ; PERRIER (92) p. 159, n. sp.

Lasiaster hispidus ; PFEFFER (93) p. 118.

Lepidaster, discussed ; STÜRTZ (115) pp. 52 & 72.

Leptoptychaster arcticus, variations in length of rays ; VERRILL (125) p. 255.

Linckia diplax (p. 162), *L. guildingii* (p. 163), *L. miliaris* (p. 162), *L. pacifica* (p. 162); RUSSO (104).

L. costæ, Daret Id., Red Sea ; RUSSO (104) Boll. Soc. Napoli, vii, p. 163, n. sp.

Linckiidæ, discussed, key to subfamilies and genera ; PERRIER (92) p. 327.

Lophaster furcifer ; PFEFFER (93) pp. 104 & 119.

†*Loriolaster* and *L. mirabilis*, discussed ; STÜRTZ (115) pp. 47 & 63.

Luidia ciliaris ; MEISSNER & COLLIN (80) p. 336 ; 120 metres, La Ciotat ; KOEHLER (56) p. 410. *L. sarsi* ; PERRIER (92) p. 195 ; first noted in Mediterranean, distinguished from *L. ciliaris* ; KOEHLER (56) p. 411.

L. paucispina, W. of Candia, 755 metres, and S.E. of C. Malea, 1292 metres ; MARENZELLER (75) Denk. Ak. Wien, lx (v), p. 3, n. sp.

Lytaster, n. g., with type *L. inæqualis*, Str. of Bocayna, 30–259 metres ; PERRIER (92) p. 98, n. sp.

Machairaster, Perrier, syn. of *Styracaster* ; PERRIER (92) p. 218.

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Mammaster, n. g., with type *M. sigsbeei* (olim *Zoroaster*) redescribed; PERRIER (92) p. 125.

Marginaster, diagnosed, distribution of species; PERRIER (92) p. 164. *M. capreensis* (Gasco), redescribed and figured; MARENZELLER (75) p. 6. *M. echinulatus*, redescribed (p. 169), *M. pectinatus*, redescribed (p. 167), *M. pentagonus*, redescribed and figured (p. 165); PERRIER (92).

Medusaster, discussed; STÜRTZ (115) pp. 54 & 73.

Myxaster, n. g., with type, *M. sol*, coast of Senegal and R. Ouro, 1400–1550 metres; PERRIER (92) p. 177, n. sp.

Myxasteridæ, n. fam.; PERRIER (92) p. 177.

Narcissia canariensis, discussed; PERRIER (92) p. 330. *N. teneriffæ*, Gray, syn. of *N. canariensis*; *l. c.*

Nardoa ægyptiaca; LORIOL (64) p. 62.

Neomorphaster, diagnosed (p. 133), *N. eustichus*, Sladen, syn. of *N. talismani* (Perrier) (p. 134), *N. talismani*, redescribed and figured (p. 134); PERRIER (92).

N. forcipatus, George's Bank and Martha's Vineyard, 852–990 fms.; VERRILL (125) P. U. S. Mus. xvii, p. 269, n. sp.

Nymphaster, Sladen, syn. of *Dorigona*; PERRIER (92) p. 365.

Odinia, diagnosed; PERRIER (92) p. 71. *O. americana*, not a *Freyella*; VERRILL (125) p. 279. *O. elegans* (p. 71), *O. robusta* (p. 78), and *O. semi-coronata* (p. 75), redescribed and figured; PERRIER (92).

Odontaster, diagnosed and compared with *Gnathaster* (p. 262), *O. hispidus*, redescribed, 6-rayed (p. 263); VERRILL (125).

Ophidiaster attenuatus, distinguished from *O. ophidianus*; KOEHLER (56) p. 412. *O. helichostichus*; BELL (7) p. 405. *O. ophidianus*; PERRIER (92) p. 330.

Palæaster, discussed; STÜRTZ (115) pp. 41 & 58.

†*Palænectria devonica*, vide sub *Palæostella solida*.

Palæocoma, discussed; STÜRTZ (115) pp. 45 & 62.

†*Palæostella*, discussed (pp. 42 & 58), *P. solida*, a fresh specimen figured and described, if not identical with type, which author cannot see because it is in British Museum, it is to form type of *Palænectria devonica*, n. g. et sp. (p. 8); STÜRTZ (115).

Palasterina, discussed; STÜRTZ (115) pp. 43 & 60.

Palasteriscus, discussed; STÜRTZ (115) pp. 44 & 61.

Palmipes membranaceus; MARENZELLER (75) p. 8; KOEHLER (56) p. 409; at Cette; KOEHLER (55) p. 7.

Paragonaster, diagnosed, discussed, distribution of species; PERRIER (92) p. 355. *P. cylindratus*, Sladen, probable syn. of *P. formosus*; VERRILL (125) p. 257. *P. elongatus*, redescribed and figured; PERRIER (92) p. 362. *P. formosus*; VERRILL (125) p. 257. *P. subtilis*, redescribed and figured; PERRIER (92) p. 358.

P. strictus, between Dakar and La Praya, 3655 metres, perhaps young of *P. subtilis*; PERRIER (92) p. 363, n. sp.

Pararchaster, diagnosed, discussed, distribution of species; PERRIER (92)

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p. 252. *P. armatus*, Sladen, syn. of *Benthopecten spinosus*; VERRILL (125) p. 245. *P. folini*, redescribed and figured, abnormality in pedicellariæ, internal skeleton described; PERRIER (92) p. 256. *P. huddlestonii*, figured; ALCOCK (2). *P. semisquamatus*, var. *occidentalis*, Sladen, syn. of *Benthopecten spinosus*; VERRILL (125) p. 245. *P. simplex*, redescribed from Martinique; PERRIER (92) p. 254. *P. violaceus*, figured; ALCOCK (2).

P. fischeri, Pilones, 1056–1435 metres; PERRIER (92) p. 263, n. sp.

Patiria briareus, Macclesfield Bank, 30–46 fms., regeneration of arms; BELL (7) P. Zool. Soc. London, 1894, p. 404, n. sp.

Paxillosa, diagnosed, key to families; PERRIER (92) p. 192.

Pectinaster, diagnosed, distribution of species (p. 278), *P. filholi*, redescribed and figured, compared with *P. forcipatus* and *P. mimicus* (p. 280), *P. insignis*, Perrier, pars, referred to *Dytaster* (p. 302); PERRIER (92).

Pedicellaster, diagnosed, distribution of species (p. 99), *P. margaritaceus*, Perrier, is type of n. g. *Gastraster* (p. 103), *P. sexradiatus*, redescribed and figured (p. 100); PERRIER (92). *P. typicus*, M. Sars (*palæocrystallus*, Sladen); PFEFFER (93) p. 119.

Pedicellasteridæ, discussed, diagnosed, key to genera; PERRIER (92) p. 90.

Pentaceros dorsatus; PERRIER (92) p. 406. *P. muricatus*; RUSSO (104) p. 162.

Pentagonaster, diagnosed, distribution of species (p. 389), *P. alexandri*, Perrier, type of n. g. *Rosaster* (p. 387), *P. arenatus*, Perrier, referred to *Dorigona* (p. 379), *P. grandis*, Perrier, syn. of *P. perrieri* (p. 391), *P. granularis*, var. *deplasi*, (olim *P. deplasi*), redescribed and figured (p. 401), *P. perrieri*, redescribed, individuals of different sizes (p. 391); PERRIER (92). *P. pulvinus*, figured; ALCOCK (2). *P. semilunatus*, Linck, type of n. g. *Phaneraster* (p. 388), *P. subspinosus*, Perrier, referred to *Dorigona* (p. 375), *P. ternalis*, Perrier, referred to *Dorigona* (p. 371); PERRIER (92).

P. eximius, La Have Bank and Nova Scotia, 120 & 80 fms.; VERRILL (125) P. U. S. Mus. xvii, p. 264. *P. gosselini*, Canaries to Morocco, 946–1440 metres; PERRIER (92) p. 399. *P. hæsitans*, C. Ghir, 2210 metres; PERRIER (92) p. 397. *P. hystricis*, N. of Benghazi, 680 metres, N.W. of Candia, 943 metres, and S. of Cerigo, 946 metres; MARENZELLER (75) Denk. Ak. Wien, lx (v), p. 4. †*P. picteti*, Cenomanian, Le Havre; LORIOL (65) Rev. Suisse Zool. iv, p. 476. *P. vincenti*, Canaries and near Mazaghan, 946 & 1105 metres; PERRIER (92) p. 396 : n. spp.

Pentagonasteridæ, discussed, diagnosed, key to subfamilies and genera; PERRIER (92) p. 333; limits discussed; VERRILL (125) p. 266.

Persephonaster cœlochiles, and *P. rhodopeplus*, figured; ALCOCK (2).

Petraster, Bill., syn. of *Palæaster*; STÜRTZ (115) p. 41.

Phaneraster, n. g., with type *P. semilunatus* (olim *Pentagonaster*); PERRIER (92) p. 387.

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Phoxaster pumilus, Sladen, is young of *Bathybiaster robustus*; VERRILL (125) p. 256.

Plutonaster, diagnosed, discussed, distribution of species; PERRIER (92) p. 312. *P. agassizi*, variations, and 6-rayed; VERRILL (125) p. 248. *P. bifrons*; MARENZELLER (75) p. 3; discussed; PERRIER (92) p. 314. *P. edwardsi*, diagnosed; *l. c.* *P. efflorescens*, discussed (p. 322), *P. inermis*, redescribed (p. 319), *P. intermedius*, redescribed, compared with *P. rigidus* (p. 316), *P. notatus*, variations from type (p. 318), *P. pulcher*, discussed (p. 322); PERRIER (92). *P. rigidus*, and var. *semiarmata*, Sladen, syn. of *P. agassizii*; VERRILL (125) p. 248.

Pontaster, diagnosed, distribution of species; PERRIER (92) p. 286. *P. hebitus*, compared with *P. tenuispinus*; VERRILL (125) p. 247. *P. hispidus*, figured; ALCOCK (2). *P. forcipatus*; VERRILL (125) p. 247. *P. marionis*, redescribed and figured; PERRIER (92) p. 290. *P. sepitus*, redescribed; VERRILL (125) p. 247. *P. tenuispinus*; PFEFFER (93) pp. 101 & 117. *P. venustus*, variations from type, with n. var. *trispinosa*, Azores; PERRIER (92) p. 287.

P. oligoporus, Antilles, 274 metres; PERRIER (92) p. 293. *P. perplexus*, C. Blanc, N. of Banc d'Arguin, 2330 metres; *op. cit.*, p. 288 : n. spp.

Pontasterinæ, new subfam.; VERRILL (125) p. 246.

Poraniidæ, discussed, diagnosed, key to genera; PERRIER (92) p. 163.

Porcellanaster, diagnosed, distribution of species; PERRIER (92) p. 210. *P. granulosus*, coast of Morocco, 2320–3200 metres; PERRIER (92) p. 216. *P. inermis*, Azores, 2995 metres; *op. cit.*, p. 212 : n. spp.

Porcellanasteridæ, discussed, genera diagnosed, epiproctal appendage; PERRIER (92) p. 197.

Prognaster, n. g., with type *P. longicauda*, C. Verde Is., Azores, &c., 1260 to 3526 metres; PERRIER (92) p. 120, n. sp.

Protasteracanthion, discussed; STÜRTZ (115) pp. 54 & 75.

Pseudarchaster intermedius; VERRILL (125) p. 249. *P. mosaicus*, figured; ALCOCK (2).

P. concinnus, off George's Bank and elsewhere, 123–1255 fms., variations; VERRILL (125) P. U. S. Mus. xvii, p. 250, n. sp.

Pseudaster, diagnosed, and *P. cordifer*, redescribed and figured; PERRIER (92) p. 235.

Psilaster andromeda, young with epiproctal appendage; PERRIER (92) p. 195. *P. floræ*; VERRILL (125) p. 255.

Pteraster, diagnosed, distribution of species; PERRIER (92) p. 181. *P. militaris*, and *P. pulvillus*; PFEFFER (93) pp. 104 & 119.

P. alveolatus, Azores, 4060 metres; PERRIER (92) p. 183. *P. (Temnaster) hexactis*, Newfoundland Bank, 57 fms., with young; VERRILL (125) P. U. S. Mus. xvii, p. 275. *P. sordidus*, coast of Morocco, 1139 metres; PERRIER (92) p. 182 : n. spp.

Pterasteridæ, discussed, diagnosed, key to genera; PERRIER (92) p. 180.

Radiaster, diagnosed (p. 172), *R. elegans*, redescribed (p. 173); PERRIER (92).

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Remaster, n. subgen., with type *Korethraster* (*Remaster*) *palmatus*, which is redescribed; PERRIER (92) p. 161.

Rhegaster tumidus, variation in marginal plates; PFEFFER (93) pp. 102 & 118.

Rhipidaster vannipes; BELL (7) p. 405.

Rhopalocoma, discussed, probably a subgenus of *Bdellacoma*; STÜRTZ (115) pp. 46 & 63.

Roemeraster, discussed; STÜRTZ (115) pp. 52 & 73.

Rosaster, n. g., with type *R. alexandri* (olim *Pentagonaster*); PERRIER (92) p. 386.

Salteraster, discussed; STÜRTZ (115) pp. 42 & 58.

Schœnaster, discussed; STÜRTZ (115) p. 44.

Solaster endeca; PFEFFER (94) pp. 99, 104 & 118; MEISSNER & COLLIN (80) p. 339.

S. benedicti, George's Bank and Martha's Vineyard, 956–1081 fms. (p. 273), *S. syrtensis*, Cape Cod, Nova Scotia, and elsewhere, 45–101 fms. (p. 271); VERRILL (125) P. U. S. Mus. xvii : n. spp.

Solasteridæ, discussed, divided into *Solasterinæ* and *Korethrasterinæ*, key to genera; PERRIER (92) p. 151.

Spinulosa, the order discussed, with key to families; PERRIER (92) p. 138.

†*Stenaster*, discussed (pp. 40 & 56), *S. salteri*, Bill., referred to *Urasterella* (p. 41); STÜRTZ (115).

Stephanaster, diagnosed (p. 402), *S. bourgeti*, C. Verde Is., 410–470 metres (p. 403); PERRIER (92), n. sp.

Stichaster albulus, 6-armed; PFEFFER (94) pp. 98, 103 & 118. *S. talismani*, Perrier, referred to *Neomorphaster*; PERRIER (92) p. 134.

S. suteri, New Zealand; LORIOL (65) Rev. Suisse Zool. iv, p. 477, n. sp.

Stichasteridæ, discussed, diagnosed, key to genera; PERRIER (92) p. 128.

Stolasterias glacialis; PERRIER (92) p. 109. See also *Asterias*.

Styracaster, diagnosed, distribution of species; PERRIER (92) p. 218.

S. edwardsi, C. Verde Is., 3655 metres (p. 220), *S. spinosus*, Azores, 2995 metres (p. 233); PERRIER (92) : n. spp.

Tethyaster, raised to generic rank (p. 322), *T. subinermis* (p. 323); PERRIER (92).

Tylaster willei; PFEFFER (93) p. 118.

†*Uraster hirudo* and †*U. ruthveni*, Forbes, referred to *Stenaster*; STÜRTZ (115) p. 40. †*U. obtusus*, Forbes, possibly a *Urasterella*; *op. cit.*, p. 41. *U. rubens*, divided ray; WINCKWORTH (129).

Urasterella, discussed; STÜRTZ (115) pp. 40 & 56.

Valvata, discussed, defined, key to families; PERRIER (92) p. 326.

Velata, discussed, key to families; PERRIER (92) p. 176.

†*Xenaster*:—*X. margaritatus*, discussed (pp. 51 & 71), *X. simplex*, discussed (pp. 50 & 71); STÜRTZ (115).

Zoroaster, diagnosed, distribution of species (p. 115), *Z. ackleyi*, redescribed (p. 117), *Z. fulgens* (p. 116), *Z. sigsbeei*, Perrier, is type of n. g. *Mammaster* (p. 125); PERRIER (92). *Z. zea*, figured; ALCOCK (2).

Zoroasteridæ, discussed, diagnosed, key to genera; PERRIER (92) p. 113.

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(E.)—OPHIUROIDEA.

Classification into Suborders, Families, and Genera, with special reference to fossils; STÜRTZ (115) pp. 16–32.

†*Acroura*, validity of genus, and list of species, discussed, *A. coronæformis*, Muschelkalk, discussed and described; ANDREAE (4) p. 6.

Amphiura chiajei; MARENZELLER (75) p. 12; MEISSNER & COLLIN (80) p. 334. *A. elegans*; *op. cit.*, p. 335. *A. filiformis*; *op. cit.*, p. 334; MARENZELLER (75) p. 12. *A. squamata*, synonymy; KOEHLER (56) p. 413; breeding season; GARSTANG (36) p. 228; at Cette, parasitic castration by *Orthonectidæ*; KOEHLER (55) p. 4. *A. sundevallii*; PFEFFER (93) pp. 107 & 121.

A. rosea, Wellington Harbour, 10–15 fms., evisceration of disc; FARQUHAR (30) Tr. N. Zealand Inst. xxvi, p. 109, n. sp.

Astrophyton arborescens; KOEHLER (56) p. 416; anatomical details; CAPRIA (18). *A. clavatum*; LORIOL (64) p. 56. *A. eucnemis*; PFEFFER (93) pp. 108 & 121.

Asteroschema rousseaui; redescribed from Mauritius; LORIOL (64) p. 55.

A. clavigera, George's Bank, 956 fms., on a *Paramuricea*, variations; VERRILL (125) P. U. S. Mus. xvii, p. 295, n. sp.

†*Bundenbachia beneckei* and *B. grandis* compared; STÜRTZ (115) pp. 21 & 22.

Eucladia, discussed; STÜRTZ (115) p. 30.

Eugaster, discussed; STÜRTZ (115) p. 20.

Furcaster, discussed; STÜRTZ (115) p. 25.

†*Helianthaster*, discussed (p. 30), *H. rhenanus*, description corrected, new figure (p. 12); STÜRTZ (115).

Onychaster, discussed; STÜRTZ (115) p. 30.

Ophiacantha bidentata; PFEFFER (93) pp. 108 & 121, and (94) p. 99. *O. setosa*; MARENZELLER (75) p. 12; KOEHLER (56) p. 414.

Ophiactis savignyi, *O. sexradiata*, and *O. virens*; RUSSO (104) p. 161.

Ophiarachna armata, Trosch., referred to *Pectinura*; LORIOL (64) p. 13.

O. mauritiensis (p. 32), and *O. robillardi* (p. 31), Mauritius; LORIOL (64) Mem. Soc. Geneve, xxxii (1): n. spp.

Ophiarthrum lymani, Mauritius; *op. cit.*, p. 34, n. sp.

Ophiocoma alternans, Martens, not young but var. of *O. scolopendrina*; LORIOL (64) p. 25. *O. brevipes*, redescribed from Mauritius, includes *O. insularia* and *O. ternispina*; *l. c.* *O. crassispina*, and *O. echinata*; RUSSO (104) p. 161. *O. erinaceus*, distinguished from *O. scolopendrina* (p. 21), *O. lineolata* (p. 28), *O. scolopendrina*, discussed (p. 23), *O. valentiae*, redescribed from Mauritius (p. 29); LORIOL (64).

Ophioconis forbesi; KOEHLER (56) p. 412.

Ophiocrene, n. g., with type *O. ænigma*, Macclesfield Bank, 45 fms., an Astrophytoid with calycinal system; BELL (7) P. Zool. Soc. London, 1894, p. 408, n. sp.

Ophiocten abyssicolum [sic], redescribed and figured; MARENZELLER (75) p. 11. *O. sericeum*; PFEFFER (93) pp. 106 & 121, and (94) p. 99.

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†*Ophioderma*? *asteriformis*, discussed (p. 5), †*O. hawhecorni*, discussed (p. 4); ANDREAE (4). *O. longicauda*; KOEHLER (56) p. 412.

Ophioglypha affinis; MEISSNER & COLLIN (80) p. 333. *O. albida*; *op. cit.*, p. 330; variations in direction of *O. affinis* and *O. grubei*; KOEHLER (56) p. 413. *O. bullata*, variations described; VERRILL (125) p. 295. *O. carnea*, a N. Atlantic sp. found S.W. of Cerigo; MARENZELLER (75) p. 11. *O. ciliata*; MEISSNER & COLLIN (80) p. 332. *O. lacertosa*, at Cette; KOEHLER (55) p. 7. *O. nodosa*; PFEFFER (93) pp. 106 & 120, and (94) p. 99. *O. robusta*; PFEFFER (93) pp. 106 & 120, and (94) p. 99. *O. sarsi*; PFEFFER (93) p. 120; MEISSNER & COLLIN (80) p. 334. *O. stuwitzii*; PFEFFER (93) p. 120. *O. texturata*, synonymy; KOEHLER (56) p. 412.

O. grandis, George's Bank, 1742 fms. (p. 293), *O. saurura*, George's Bank and Grand Bank, 677 & 471 fms., with variations (p. 288), *O. tessellata*, E. Coast U. S. A., 39° 35′–41° 47′ N., 400-2033 fms., with variations (p. 290); VERRILL (125) P. U. S. Mus. xvii : n. spp.

Ophiolepis annulosa; RUSSO (104) p. 161; redescribed from Mauritius; LORIOL (64) p. 10. *O. cincta*; RUSSO (104) p. 162; vars. from Mauritius; LORIOL (64) p. 9.

Ophiomyxa pentagona; KOEHLER (56) p. 416.

O. robillardi, Mauritius; LORIOL (64) Mem. Soc. Geneve, xxxii (1) p. 53, n. sp.

Ophionereis dubia, redescribed from Mauritius, distinguished from *O. crassispina*; LORIOL (64) p. 19.

Ophiopeza fallax, redescribed and figured from Mauritius; LORIOL (64) p. 4.

Ophiopezella, discussed and maintained; LORIOL (64) p. 6.

O. dubiosa, Mauritius; LORIOL (64) Mem. Soc. Geneve, xxxii (1), p. 7, n. sp.

Ophiopleura borealis; PFEFFER (93) pp. 107 & 121.

Ophioplocus imbricatus; LORIOL (64) p. 12.

Ophiopholis aculeata; MEISSNER & COLLIN (80) p. 335; PFEFFER (93) pp. 108 & 121, and (94) p. 99.

Ophiopsila aranea; KOEHLER (56) p. 414.

Ophiopteron elegans; BELL (7) p. 408.

Ophioscolex glacialis; PFEFFER (93) pp. 107 & 121.

Ophiothela isidicola (p. 52), compared with *O. verrilli* (p. 53); LORIOL (64).

Ophiothrix, variation discussed; BELL (7) p. 407; the species of the Mediterranean discussed; KOEHLER (56) p. 415. *O. alopecurus*, Lyman, maintained; RUSSO (105) p. 6. *O. cataphracta*; RUSSO (104) p. 160. *O. echinata*; *op. cit.*, p. 161; commensal with sponge; RUSSO (105) p. 7; commensal annelid, and species maintained; KOEHLER (56) p. 416; at Cette; KOEHLER (55) p. 17. *O. fragilis*; RUSSO (104) p. 160; variation, young; MEISSNER & COLLIN (80) p. 336; synonymy and diagnosis; RUSSO (105) p. 6; at Cette;

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KOEHLER (55) pp. 4 & 7. *O. longipeda*; RUSSO (104) p. 160; description corrected; LORIOL (64) p. 36. *O. lusitanica*, discussed; RUSSO (105) p. 7. *O.* (? *pentaphyllum*), breeding season; GARSTANG (36) p. 228. *O. suensonii*; RUSSO (104) p. 160. *O. trilineata* (p. 43), and *O. triloba* (p. 41), redescribed from Mauritius; LORIOL (64). *O. violacea*; RUSSO (104) p. 161.

O. fallax (p. 47), *O. lepidus* (p. 45), *O. mauritiensis* (p. 38), *O. picturatus* (p. 49), *O. robillardi* (p. 39), and *O. tristis* (p. 50), Mauritius; LORIOL (64) Mem. Soc. Geneve, xxxii (1) : n. spp.

Ophiura annulosa Lam., probably *Ophiocoma scolopendrina*; LORIOL (64) p. 12. †*O. decheni* STÜRTZ (p. 28), †*O. primigena* STÜRTZ (p. 27), and *O. zitteli* STÜRTZ (p. 27), discussed; STÜRTZ (115).

†*O. rhenana*, Lower Devonian, Bundenbach; STÜRTZ (115) Verh. Ver. Rheinland, l, pp. 7 & 29, n. sp.

†*Ophiurella griesbachi*, discussed; STÜRTZ (115) p. 90.

Ophiurina, redescribed; STÜRTZ (115) p. 24.

Palæophiura, rediagnosed; STÜRTZ (115) p. 21.

Pectinura armata, redescribed from Mauritius; LORIOL (64) p. 13.

P. *elegans*, Macclesfield Bank, 13-35 fms.; BELL (7) P. Zool. Soc. London, 1894, p. 406. *P. sphenisci*, Holothuria Bank, N.W. Australia, 15 fms.; *l. c.* *P. venusta*, Mauritius, with slight variations; LORIOL (64) Mem. Soc. Geneve, xxxii (1) p. 16 : n. spp.

Protaster, discussed; STÜRTZ (115) pp. 18–20 & 25.

Taeniaster, discussed; STÜRTZ (115) p. 20.

(F.)—CRINOIDEA.

General classification on phylogenetic basis; JAEKEL (44).

Acrochordocrinus, vide sub *Cyclocrinus*.

†*Actinocrinus* :—*A. tenuistriatus*; STÉFANI (112) p. 32.

A. monticuliferus, Keokuk Group, Tennessee; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 46, n. sp.

Actinometra sp., with unusual syzygies; BELL (7) p. 402.

A. peregrina, Macclesfield Bank, 55 fms.; BELL (7) P. Zool. Soc. London, 1894, p. 402, n. sp.

†*Adelocrinus hystrix* Phillips; see *Perischodomus magnus*, IV, c.

†*Alloprosallocrinus celsus*, Warsaw Group, Tennessee; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 47, n. sp.

Antedon, præoral lobe, homologies with *Asteroidea*; MACBRIDE (72) p. 433. *A. carinata*, from Mauritius and Rio Janeiro; LORIOL (64) p. 57. *A. eschrichti*; PFEFFER (93) pp. 108 & 122; RODGER (99) p. 160. *A. palmata*, habitat; THURSTON (122) p. 27. *A. phalangium*; KOEHLER (56) p. 425; MARENZELLER (75) p. 3. *A. prolixa*; PFEFFER (93) pp. 109 & 122; RODGER (99) p. 162. *A. rosacea*; MARENZELLER (75) p. 3; KOEHLER (56) p. 426; at Cette; KOEHLER (55) p. 4; senses of smell and taste; NAGEL (86) p. 177; parasitic infusorian; CUÉNOT (28); ova described; CRETY (27)

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p. 264; breeding season; GARSTANG (36) p. 228. *A. tenella*; PFEFFER (93) pp. 109 & 122.

A. n. sp. indescr.; RODGER, P. Soc. Edinb. (99) p. 162. †*A. arnaudi*, Upper Campanian, Courgeac (Charente) and Talmont (Charente Inférieure); LORIOL (65) Rev. Suisse Zool. iv, p. 479. *A. bassett-smithi*, Macclesfield Bank, 13–16 fms., irregular syzygies; BELL (7) P. Zool. Soc. London, 1894, p. 399. *A. brevicirra*, Macclesfield Bank, 30–35 fms.; *op. cit.*, p. 400. †*A. carentonensis*, Coniacian, Rousselières (Charente); LORIOL (65) Rev. Suisse Zool. iv, p. 483. *A. fieldi*, 22–30 fms. (p. 401), *A. flavomaculata*, 13 fms. (p. 400), *A. inopinata*, 31 fms. (p. 398), *A. moorei*, 13 fms. (p. 401), and *A. vicaria*, 30–40 fms. (p. 400), Macclesfield Bank; BELL (7) P. Zool. Soc. London, 1894: n. spp.

†*Apiocrinus champlittensis*, Rauracian, Champlitte (Hte.-Saône); LORIOL (65) Rev. Suisse Zool. iv, p. 485, n. sp.

†*Archæocrinus*:—*A. asperatus* (p. 19), *A. parvus* (p. 21), and *A. peculiaris* (p. 17), Trenton Group, Knox co., Tenn.; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5: n. spp.

Articulata, restricted and defined as suborder; JAEKEL (44) p. 120.

Articulosa, new suborder; JAEKEL (44) p. 118.

†*Balanocrinus pentagonalis*; RICHE (98) p. 352.

†*Barycrinus expansus*, Keokuk Group, Tennessee; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 41, n. sp.

†*Batocrinus*:—*B. copiosus*, Kaskaskia Group, Little Barren River; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 51. *B. sacculus*, Warsaw Group, Washington co., Ind.; *op. cit.*, p. 53: n. spp.

†*Bourgueticrinus*:—*B. elliptious*; KOCH (54) pp. 298 & 314. *B. italicus* (p. 418), *B. thorenti* (p. 422), *B. zignoi* (p. 422); ROVASENDA (101).

†*Calceocrinus kentuckiensis*, Trenton Group, Mercer co., Ky. [This is a *Castocrinus*, as the authors admit]; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 29, n. sp.

†*Callicrinus uralicus*, nom. nud.; CHERNUISHEV (20) p. 123.

†*Carabocrinus ovalis*, Trenton Group, Mercer co., Ky.; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 25, n. sp.

†*Castocrinus*, see *Calceocrinus*.

Cladocrinoidea, new order; JAEKEL (44) pp. 110 & 113.

Comatula, see *Antedon*.

Condylocrinus verrucosus; CHERNUISHEV (20) p. 123.

†*Conocrinus*:—*C. cilindricus*? (nom. nud.) (p. 422), *C. piriformis* (p. 420); ROVASENDA (101). *C. thorenti*; *op. cit.*, pp. 420 & 422; KOCH (54) p. 298.

Costata, new suborder; JAEKEL (44) p. 117.

†*Cyathocrinus, cf. ramosus*, Schloth., described and figured, Permian, East Russia-in-Europe; NECHAEV (87) p. 116.

†*Cyclocrinus*:—*C. amalthei* (p. 57), *C. hausmanni* (Roem.) (p. 56); PARONA (89). *C. macrocephalus*; RICHE (97) pp. 82, 93 & 94, and (98) pp. 287 & 329.

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†*Dolatocrinus*, structure discussed (p. 30), *D. lacus*, redescribed (p. 9), *D. marshi*, redescribed (p. 11), *D. ornatus*, now first figured (p. 18), *D. ornatus*, var. *asperatus*, n. var., Hamilton Group, Charleston, Ind. (p. 16); MILLER & GURLEY (81).

D. amplus, Hamilton Group, Charleston, Ind.; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 45. *D. approximatus*, Louisville, Ky. (p. 25), *D. aureatus*, Charleston, Ind. (p. 24), *D. bulbaceus*, Charleston Ind. (p. 22), *D. grandis*, Louisville, Ky. (p. 14), *D. greenei*, Louisville, Ky. (p. 28), *D. lineolatus*, Charleston, Ind. (p. 27), *D. magnificus*, Falls of Ohio (p. 5), *D. spinosus*, Charleston, Ind. (p. 8), *D. stellifer*, Louisville, Ky., and Charleston, Ind. (p. 20), and *D. venustus*, Charleston, Ind. (p. 23), Hamilton Group; MILLER & GURLEY (81) Bull. Illinois Mus., No. 4 : n. spp.

Dorycrinus greenei, Keokuk Group (Knobstone), Button Knobs, Ky.; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 48, n. sp.

Encrinidæ, systematic position; JAEKEL (47) p. 162.

†*Encrinus*:—*E. carnalli*, tegmen; JAEKEL (46); tegmen and anal tube; JAEKEL (47) p. 158. *E. gracilis*; BÖSE (11) p. 4. *E. cf. liliiformis*; l. c. *E. schlotheimi*, tegmen; JAEKEL (46), and (47) p. 160.

Eudiocrinus granulatus, Macclesfield Bank, 30–40 fms.; BELL (7) P. Zool. Soc. London, 1894, p. 397, n. sp.

†*Eugeniacrinus mayalis*; PARONA (89) p. 58.

Fistulata redefined; JAEKEL (44) p. 115.

†*Glyptocrinus mercerensis*, Trenton Group, Mercer co., Ky.; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 28, n. sp.

†*Gyssocrinus* [sic] (?) *borealis*, nom. nud.; CHERNUISHEV (20) p. 123.

†*Ichthyocrinus*:—*I. clarkensis*, Keokuk or Warsaw Group, Clark co., Ind.; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 43. *I. spinosulus*, Keokuk Group (Knobstone), Clark co., Ind.; *op. cit.*, p. 44 : n. spp.

†*Lahuseniocrinus*, n. g., with type *L. tirlensis*, n. sp., Hercynian, Oural, nom. nud.; CHERNUISHEV (20) Bull. Com. geol. St. Petersb. pp. 123 & 133.

Larvata, new suborder; JAEKEL (44) p. 116.

†*Lecanocrinus oswegoensis*, Niagara Group, Oswego, Ill.; MILLER & GURLEY (81) Bull. Illinois. Mus., No. 4, p. 33, n. sp.

†*Marsupites*, first recorded from I. of Wight; GRIFFITH (39).

†*Megistocrinus expansus*, Hamilton Group, Louisville, Ky.; MILLER & GURLEY (81) Bull. Illinois Mus., No. 4, p. 35, n. sp.

†*Melocrinus*:—*M. lylii* (p. 152), *M. tersus* (p. 151), Hamilton Group, Callaway co., Mo.; ROWLEY (102) Amer. Geol. xiii : n. spp.

†*Millericrinus*:—*M.* sp.; RICHE (97) p. 82, and (98) p. 287. *M.* sp. ind.; PARONA (89) p. 58. *M. cf. adneticus*; l. c. *M. cf. granulosus*; RICHE (98) p. 287. *M. granulosus*, p. 329; *op. cit.*, and (97) p. 94. *M. hausmanni*, referred to *Cyclocrinus* (p. 56), *M. marginatus*, figured (p. 57); PARONA (89). *M. mespiliformis*, Rauracian, Beaune (Côte-d'Or), first occurrence in France; LORIOL (65) p. 491.

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M. belnensis (p. 489), and *M. burgundicus* (p. 487), Rauracian, Beaune (Côte-d'Or); LORIOL (65) Rev. Suisse Zool. iv. *M. gemmatus*, columnals only, Lias, Gozzano; PARONA (89) Mem. Acc. Torino, xliii, p. 57 : n. spp.

Mitrocrinus, n. g., with type *M. wetherbyi*, Trenton Group, Knox co., Tenn.; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 22, n. sp.

Pentacrinoidea, new order; JAEKEL (44) pp. 110 & 114.

†*Pentacrinus*:—*P.* sp.; BOTTO-MICCA (12) p. 193; RICHE (98) p. 99; said to occur in Silurian; KIESOW (50) p. 82. *P. bajocensis*; RICHE (97) pp. 61 & 62, and (98) pp. 71 & 172. *P. basaltiformis*; PARONA (89) p. 56. *P. cristagalli*; FREYSTEDT (32) pp. 129 & 136; RICHE (91) p. 71. *P. didactylus*; KOCH (54) p. 287; ROVASENDA (101) pp. 418 & 422. *P. jurensis*; PARONA (89) p. 56. *P. nicoleti* (p. 239), *P. oxyscalaris* (p. 352); RICHE (98). *P. pentagonalis*; RICHE (97) p. 98. *P. tuberculatus*; TERMIER & KILIAN (118) p. 276.

P. leuthardi, Bathonian, Sichtern near Basle, with infrabasalia; LORIOL (65) p. 494, n. sp.

†*Platycrinus*:—*P.* sp.; DANTZ (29) p. 623.

P. cortina, Chouteau Limestone, Sedalia, Mo.; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 40, n. sp.

Porocrinidæ, n. fam., *op. cit.*, p. 24.

†*Porocrinus kentuckiensis*, Trenton Group, Mercer co., Ky.; *l. c.*, n. sp.

†*Poteriocrinus*:—*P. quenstedi*, Golowkinsky, columnal described and figured, Permian, East Russia-in-Europe; NECHAEV (87) p. 117. *P. scopæ*, additional figures; MILLER & GURLEY (82) p. 33.

P. circumtextus, Keokuk Group, Crawfordsville, Ind. (p. 31), *P. hammondi*, Kinderhook Group, Le Grand, Iowa (p. 35), *P. maccabei*, Kinderhook Group, Le Grand, Iowa (p. 34), *Poteriocrinus maccabei* var. *decrepitus*, n. sp. [sic], Kinderhook Group, Le Grand, Iowa (p. 36); MILLER & GURLEY (82) Bull. Illinois Mus., No. 5 : n. spp.

†*Retiocrinus alveolatus*, Trenton Group, Mercer co., Ky.; *op. cit.*, p. 26, n. sp.

†*Rhizocrinus santagatai*, Menegh., no crinoid but a foraminifer, *Bathysiphon*; CAPELLINI (17).

†*Synbathocrinus angularis*, Keokuk Group, Button Mould Knob, Ky.; MILLER & GURLEY (82) Bull Illinois Mus., No. 5, p. 42, n. sp.

†*Taxocrinus concavus*, arm-characters described; ROWLEY (102) p. 153

†*Traumatocrinus gracilis*; BÖSE (11) p. 7.

†*Uintacrinus socialis*, details of structure, and new locality; WILLISTON (128).

†*Zeacrinus*:—*Z. cylindricus*, Kaskaskia Group, Pulaski co., Ky. (p. 38), *Z. grandiculus*, Kaskaskia Group, Bowling Green, Ky. (p. 32), *Z. salemensis*, Keokuk Group, Salem, Ind. (p. 37); MILLER & GURLEY (82) Bull. Illinois Mus., No. 5 : n. spp.

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(G.)—†CYSTIDEA.

Æsiocystites, n. g, with type *A. priscus*, Trenton Group, Mercer co., Ky.; MILLER & GURLEY (82) Bull. Illinois, Mus., No. 5, p. 13, n. sp.

Agelacrinidæ, a new genus found, not described; JAHN (48) p. 271.

Agelacrinus legrandensis, Kinderhook Group, Le Grand, Iowa (p. 15), *A. pulaskiensis*, Kaskaskia Group, Pulaski co., Ky. (p. 16); MILLER & GURLEY (82) Bull. Illinois Mus., No. 5 : n. spp.

Atelecystis ?, sp. indet., Bala Beds, Yorkshire; REYNOLDS (96) p. 110.

Belemnocystites, n. g., with type *B. wetherbyi*, Trenton Group, Mercer co., Ky.; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5, p. 8, n. sp.

Caryocrinus bulbulus, Wayne co., Tenn. (p. 11), and *C. ellipticus*, Osgood and St. Paul, Ind. (p. 10), Niagara Group; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5 : n. spp.

Holocystites gyrinus, Jefferson co., Ind. (p. 5), and *H. splendens*, Madison, Ind. (p. 7), Niagara Group; MILLER & GURLEY (82) Bull. Illinois Mus., No. 5 : n. spp.

Mimocystis mazzettii (? nom. nud.), Devonian, Sardinia; LOVISATO (66) p. 134.

Trochocystis barrandei; MIQUEL (83) p. 106. *T. bohemicus*; JAHN (48) p. 271.

(H.)—†BLASTOIDEA.

Pentremites, ambulacra described; STEINMANN (113).

† All extinct.

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With Compliments of
F. A. BATHER
British Museum (Nat. Hist.)
London, S.W.

A Record of, and Index to the Literature of *ECHINODERMA* published during the year 1895, with a few items from previous years.

DEC 30 1896

Compiled by F. A. BATHER.

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TO ZOOLOGISTS AND PALÆONTOLOGISTS.

If the present Record be more complete than its predecessors, thanks are due to the numerous authors that have assisted the Recorder with copies of their publications. While asking his fellow-workers to continue this kind help, the Recorder begs to point out that the value of their gifts would be further increased if they bore the original pagination, volume and plate-numbers, and the correct date of publication. A re-paged reprint, issued, as is too often the case, before the true publication of the volume in which it is to appear, does not save the Recorder, or anyone else that may wish to quote it, from the trouble of referring to it in a library.

Previous Records by the present Recorder have met with much criticism. When such criticism has indicated possible improvements, the Recorder has accepted and acted upon it. For criticism of this nature he is most grateful, and would be glad if any workers on Echinoderma who actually use his Record would send him further suggestions. His object is not to save himself trouble, but to make the Record of as much use to his fellow-workers as possible.

All communications, books, and papers may be sent, either through the Editor of the "Zoological Record," or direct to

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XIV. ECHINODERMA.

BY

F. A. BATHER.

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INTRODUCTION.

I. TITLES. In the Introduction to last year's Record, it was said, "There is good reason to believe that many publications anterior to 1895, and containing Echinoderm literature, remain unrecorded." This is confirmed by the inclusion in the present list of 41 such papers; viz., 1 from 1890, 3 from 1892, 9 from 1893, and 28 from 1894. The literature of 1895 has so far yielded 138 papers dealing with *Echinoderma*; more will doubtless be found when editors and publishers choose to send the volumes containing them to this country. From 1896, two papers are recorded, since it was not until the work had been done that proof of their true date was obtained. This makes a total of 181 books and papers of which the titles are given, and that the list is not more incomplete is largely due to the kindness of authors.

Of the works here recorded, 5 have not been seen by the Recorder,

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owing to their appearance in publications that are inaccessible to the ordinary Englishman, and among such publications many of those issued in Italy have to be included. This remark applies also to CRAGIN (26), RUSSO (106, 107), SHTUKENBERGH (110), and TOMMASI (123) in the Record for 1894, and KEYES (138) in the Record for 1893. The others previously unseen have now been seen and checked by the Recorder (see under ZAHALKA, p. 21).

In the estimate of the number of titles, Reviews and Abstracts are not included unless published in the form of signed articles; they are, however, recorded under the name of the author reviewed, in all cases where they contain anything of interest to the student of Echinoderms. Of such Reviews, 122 are here recorded. Since the present record does not profess to abstract papers, and since a student can often see an abstract when [illegible] unable to procure the original paper, this reference to abstracts seems worth the slight trouble and expense.

The figures between square brackets, that follow each title, are cross-references to the divisions of the Subject- and Systematic Indices. A better mode of cross-reference might be devised were one starting a Record *ab initio*, and without reference to the system of previous Recorders.

II. BIOLOGY. In the main the arrangement of this section *is* the same as in previous years, but in II, B, i, **Anatomy**, and II, F, AUXOLOGY, the catch-numbers have been slightly altered, so as to make the numbers of the various subdivisions consonant with one another. Thus, in Auxology, under each head (i) *Echinoderma*, (ii) *Holothurioidea*, (iii) *Echinoidea*, (iv) *Asteroidea*, (v) *Ophiuroidea*, (vi) *Crinoidea*, the further divisions are as follows:—(a) Relation of Ontogeny to Phylogeny, (b) General Embryology, (c) Formation of gonads, (d) Oviposition and fertilisation, Breeding season, (e) Larval stages, free or incubated, (f) Organogeny, especially skeletogeny, (g) Postembryonic growth-stages, down to death. Head vii is, as before, **Experimental Investigation**, but this year an attempt has been made to classify the experimental methods: some of these papers are also given in the division of the Zoological Record devoted to General Subjects, but it would be a pity to omit them, since these experiments have a direct bearing on questions of evolution and distribution of *Echinoderma*.

In Anatomy the chief work is by a palæontologist, JAEKEL, on Devonian *Crinoidea*. Under Physiology one notes SCHULTZ'S observations on excretion in *Holothurioidea*. Among Bionomic researches, the most interesting is that by MARENZELLER on autotomy of an Asteroid due to a parasite. In Auxology there are the important embryological treatises by BURY & MACBRIDE; a fair number of scattered observations on later growth-stages; and much experimental investigation of fertilisation and segmentation on the ordinary species by the usual writers, BOVERI, LOEB, MORGAN, WILSON, &c.; here VERNON'S memoir is worthy of special note as an extended record of facts.

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III. DISTRIBUTION. The arrangement follows that of last year's Record. The establishment of a Section devoted to Bathymetric distribution might prove useful; this year it would have referred to BERNARD (10), MURRAY (125), HERDMAN (55), MARENZELLER (104), and especially VERRILL (164). Many of the papers that fill Section B, GEOLOGICAL DISTRIBUTION, seem to have their value lessened by inaccurate zoological nomenclature.

IV. SYSTEMATIC. This forms an Index to every genus and species mentioned in the recorded literature, provided that some definite statement has been made concerning it. When such statement is one of locality only, then nothing more than the name of the species is given. This Index should be used in connection with the cross-references given in the list of Titles.

The year 1895 saw the establishment of 264 new species and 34 new genera of *Echinoderma*, distributed as follows:—*Holothurioidea*, species 2; *Echinoidea*, genera 11, species 88; *Asteroidea*, genera 3, species 23; *Ophiuroidea*, genera 2, species 3; *Crinoidea*, genera 16, species 137; *Cystidea*, genera 2, species 8; *Blastoidea*, species 3. There are also many new varieties, and a regrettably large number of *nomina nuda*. Many of the new species are published without illustration; BERNARD, JAEKEL, LAMBERT, SLUITER, & VERRILL are a few of the zoologists who differ from their colleagues in seeing no harm in this.

The new *Echinoidea* are mostly extinct species from Sardinia and Persia, many of them based on fragments of spines, which the authors themselves regard as possibly belonging to pre-described species. It is a relief to turn to LAMBERT's careful revision of the species of *Micraster*, though even he describes and names a species in one paragraph only to prove it a synonym in the next. The chief systematic work among *Asteroidea* is by VERRILL & LEIPOLDT, though many of the new species are due to SLUITER.

The species-factories in Illinois have recently glutted the market with new names for fossil *Crinoidea*, which do not seem to find ready acceptance; it is, however, to their credit that every proposed species is figured. In proposing new generic names, they are this year rivalled by JAEKEL, who has described, but not always figured, many new species from the Devonian rocks of Germany. HARTLAUB's description of the "Blake" crinoids is a welcome contribution.

It is again necessary to point out that the numbers here given are liable to correction; indeed, these lists must continue inexact so long as authors continue to regard their scientific papers as a pleasurable and easy means of puzzling their colleagues.

Any personal remarks ventured by the Recorder are placed, as before, within square brackets.

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I. TITLES.*

ACQUISTO, V. See MONDINO, C., & ACQUISTO, V. (117).

ALCOCK, A. (5) Zool. Rec. 1893. Abstract by H. LUDWIG, Zool. Centralbl. ii, p. 197 (May), and in LUDWIG (91).

1. ——. Illustrations of the Zoology of the Royal Indian Marine surveying steamer "Investigator" . . . Echinoderma II. pls. iv & v. Calcutta, 4to.

 Gives figures of the previously described—*Zoroaster carinatus*, *Z. squameus*, *Pontaster pilosus*, *Nymphaster florifer*, *N. nova*, *Pentagonaster investigatoris*, *Dorocidaris tiara*, and *D. alcocki*.

2. APPELLÖF, A. Faunistiske undersögelser i Herlöfjorden. Bergens Mus. Aarbog. 1894–95, No. 11, 11 pp. [III, A, ii.]

3. BALLOWITZ, E. Bemerkungen zu der Arbeit von Dr. phil. K. Ballowitz über die Samenkörper der Arthropoden nebst weiteren spermatologischen Beiträgen betreffend die Tunicaten, Mollusken, Würmer, Echinodermen, und Cœlenteraten. Int. J. Anat. xi, pp. 245–280, pls. xii & xiii (1894). [*Echinoderma*, pp. 259–269, pl. xiii, figg. 62–102. II, F, i, c. IV, B, D, E.]

 Abstract in LUDWIG (91).

4. BARTHELS, P. Notiz über die Excretion der Holothurien. Zool. Anz. xviii, pp. 493 & 494 (Dec.). [II, C.]

 BATHER, F. A. (11) Zool. Rec. 1893. Review by O. JAEKEL, N. Jahrb. Min. 1895, ii, pp. 371–374 (Oct.).

5. B[ATHER, F. A., not BATESON, as suggested in Zool. Anz. xviii]. Evolution of a protective habit in Sea-urchins. Nat. Sci. vi, p. 72 (Jan.). [II, D, V, b.]

6. BATHER, F. A. The rosy Feather-Star. Nat. Sci. vi, p. 214 (March). [II, D, vi.]

7. ——. The Text-Book Writer among the Echinoderms. Nat. Sci. vi, pp. 415–423 (June). [II, B, i, f, 1, 2.]

 A review of LANG (59), Zool. Rec. 1894.

8. ——. *Brachiocrinus* and *Herpetocrinus*. Amer. Geol. xvi, pp. 213–217 (Oct.). [II, B, i, f : D, vi. IV, F.]

 Abstract in Science (n.s.) ii, p. 492 (Oct.).

9. ——, SLADEN, W. P., & THEEL, H. *Echinoderma* in "The Scientific Results of the 'Challenger' Expedition." Nat. Sci. vii, pp. 42–50, pls. viii–x (July). [III, A, i.]

10. BERNARD, F. Liste des Echinides recueillis pendant les croisières du Travailleur et du Talisman. Bull. Mus. Paris, 1895, pp. 207–209 (July). [III, A, ii. IV, C.]

* An asterisk prefixed to a quotation indicates that the Recorder has not seen the Journal or Work referred to.

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11. [Bernard, F.] Sur un Lamellibranche nouveau (*Scioberetia australis*), commensal d'un Echinoderme. C.R. Ac. Sci. cxxi, pp. 569–571 (Oct.). [II, D, viii.]

12. ——. Echinides recueillis par l'expédition du Cap Horn (1882–83). Bull. Mus. Paris, 1895, pp. 272–274 (December). [II, F, iii, e, g. III, A, ii. IV, C.]

Bittner, A. (9) Zool. Rec. 1894. Abstract by T. Ebert, N. Jahrb. Min. 1896, ii, pp. 195 & 196 (July).

13. Bizet, P. Note sur les limites du terrain Callovien dans le Nord-Ouest de la France. Bull. Soc. geol. Normand. xvi, pp. 79–119 (1894). [III, B, iii, C. IV, C.]

14. Bonarelli, G. Fossili domeriani della Brianza. Rend. Ist. Lombardo, ser. 2, xxviii, pp. 415–421 (April). [III, B, iii, C.]

15. Boveri, T. Ueber das Verhalten der Centrosomen bei der Befruchtung des Seeigel-Eies nebst allgemeinen Bemerkungen über Centrosomen und Verwandtes. Verh. Ges. Wurzburg, xxix, No. 1, pp. 1–75. [II, F, iii, d.]

Abstracts,—by R. Fick, Zool. Centralbl. ii, pp. 266–268 (July); J. R. Micr. Soc. 1895, pp. 433 & 434.

16. ——. Ueber die Befruchtungs- und Entwickelungsfähigkeit kernloser Seeigel-Eier und über die Möglichkeit ihrer Bastardirung. Arch. Entwickmech. ii, pp. 394–443, pls. xxiv & xxv (Oct.). [II, F, vii.]

Critical abstract by R. Fick, Zool. Centralbl. ii, pp. 750 & 751 (Dec.); and in Ludwig, Zool. Jahresber. for 1895.

17. Bury, H. The Metamorphosis of Echinoderms. Quart. J. Micr. Sci. xxxviii, pp. 45–135, pls. iii–ix (Aug.). [II, A: F, i, a; ii, e; iii, e; iv, e; v, e; vi, e.]

Abstracts,—in J. R. Micr. Soc. 1895, pp. 636 & 637 (Dec.); by Ludwig, Zool. Centralbl. iii, pp. 563–568 (Aug. 1896).

Capecelatro, —. See Patroni, C. (130).

18. Capellini, G. *Rhizocrinus santagatai* e *Bathysiphon filiformis*. Rend. Acc. Lincei, ser. 5, iii, pp. 211–218 (March, 1894). [IV, F.]

Abstract in Boll. Com. geol. Ital. xxvi, p. 241.

19. ——. Di alcuni fossili controversi riferiti a crinoidi, foraminiferi, vermi e corallarii. Rend. Acc. Lincei, iii (v), pp. 362–365 (Dec. 1894).

Abstract in Riv. ital. Pal. i, p. 4 (Feb.).

20. Chadwick, H. C. Notes on some specimens of *Synapta inhærens*, from Port Erin. Tr. Liverp. biol. Soc. ix, pp. 235–242, pls. xvi & xvii. [II, B, i, b, 1. IV, B.]

Abstract in J. R. Micr. Soc. 1896, p. 72 (Feb. 1896).

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21. CHUN, C. Atlantis. Biologische Studien über pelagische Organismen. II. *Auricularia nudibranchiata.* Bibl. Zool. xix, Lief 1, pp. 53–76, pls. iii & iv. [II, B, i, a, 4 : C : F, ii, e, f.]
Review by LUDWIG, Zool. Centralbl. ii, pp. 197 & 198 (May, 1895). Abstract in J. R. Micr. Soc. 1896, pp. 71 & 72 (Feb. 1896).

22. CORTESE, E. Descrizione geologica della Calabria. Mem. Carta Geol. Ital. ix, xxviii & 312 pp., iv pls., 1 map. [III, B, ii, b, c ; iii, b. IV, c.]

23. CORTI, B. Osservazioni stratigrafiche e paleontologiche sulla regione compresa fra i due rami del Lago di Como e limitata a sud dai Laglie della Brianza. Boll. Soc. geol. Ital. xi, pp. 111–207, pl. ii (1893). [III, B, iii, b.]

24. ——. Sulla fauna giurese e cretacea di Campora presso Como. Rend. Ist. Lombardo, ser. 2, xxvii, pp. 372–386 (April, 1894). [III, B, iii, c.]

COTTEAU, G. H. (46) Zool. Rec. 1893. Abstract by DAMES, N. Jahrb. Min. 1895, ii, pp. 180 & 181 (July).

25. ——. "Sur quelques espèces d'Échinides du Liban" is cited in LUDWIG (91) as Paris, 15 pp., 2 pls., 1894. Ludwig has not seen this edition ; compare (22) Zool. Rec. 1894.

26. ——. Description des Échinides recueillis par M. Lovisato dans le Miocène de la Sardaigne. Mem. Soc. geol. France, Pal. v, fasc. ii, Mem. No. 13, 56 pp., v pls. (pls. iii–vii). [II, B, ii, a : F, iii, g. III, B, ii, c. IV, C.]

27. —— & GAUTHIER, V. Mission Scientifique en Perse par J. de Morgan. Tome troisiéme, Études géologiques, Partie II. Paléontologie. Première Partie, Échinides fossiles. 142 pp. [as numbered, including blanks], xvi pls. 4to, Paris, 1895. Preliminary notice in C.R. Soc. geol. France, ser. 3, xxiii, pp. 107–109 (June). [II, B, i, c, 2; iii, b. III, B, iii, b. IV, C.]

28. COULON, L. Catalogue des Échinides de la Seine-inférieure. Bull. Soc. Elbeuf, 1894, pp. 49–112. [III, B, iii, a.]

29. CRAGIN, F. W. A new Cretaceous genus of *Clypeastridæ.* Amer. Geol. xv, pp. 90 & 91 (Feb.). [III, B, iii, b. IV, C.]

CRETY, C. (27) Zool. Rec. 1894. Abstract by U. Rossi in Monit. Zool. Ital. vi, pp. 78–81 (April).

30. CUNNINGHAM, K. M. Notice of microscopic Fossils occurring in Tertiary Marl Strata. Amer. Micr. J. xvi, pp. 193–196, i pl. (July). [III, B, ii, d.]

31. DEECKE, W. Die Mesozoischen Formationen der Provinz Pommern. Mt. Ver. Vorpomm. xxvi, pp. 1–115. [III, B, iii, b, c. IV, C : F.]

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II. BIOLOGY.

(A.) EVOLUTION.

Phylogeny of *Echinoderma* and relation to *Enteropneusta*; BURY (17) pp. 88–131. Relations to ancestor of *Chordata*; WILLEY (171) p. 250.

Phylogeny of *Spatangidæ*; LAMBERT (88) p. 153.

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(3) Homologies of cœlom and genital ducts; GOODRICH (45) p. 500.

(4) Crystal form of skeletal elements; CHUN (21) p. 73.

(5) General account of skeletal anatomy of *Echinoderma* in general, and of all Classes, with special reference to extinct forms; ZITTEL (180).

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(4) Arborescent organs, histology; HÉROUARD (57).

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(d) *ASTEROIDEA* :—(2) Structure and ground-plan of skeletal pieces; LUDWIG (90) p. 541.

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(3) Pedicellariæ described for many species, especially *Heliaster*, *Odontaster singularis*, *Nidorellia armata*, *Gymnasteria carinifera*, also dermal characters, spines, paxillæ, spicules, and papulæ minutely described and figured for many species; LEIPOLDT (84).—Pedicellariæ of *Luidia ciliaris*; KOEHLER (75) p. 319.

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(f) *CRINOIDEA* :—(1) Skeleton,—Centrodorsal and dorsocentral distinguished, existence of dorsocentral denied, term "perisomatic skeleton" explained; BATHER (7) pp. 416-418.—Tegmen,—of *Gastrocoma* (p. 75), of *Hapalocrinus* (p. 98), of *Macarocrinus* (p. 111); JAEKEL (67): of *Holocrinus* (p. 291), of *Dadocrinus* (p. 287); KOENEN (81).—Orals of *Sphærocrinus*; JAEKEL (67) p. 69.—Anus of *Dadocrinus*; KOENEN (81) p. 287.—Anals of *Sphærocrinus*; JAEKEL (67) p. 70.—Anal side of *Lophocrinus*; KOENEN (80).

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(2) Modes of union between skeletal elements; BATHER (7) p. 420.

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(iv) **Feeding**:—*Asterias rubens* and *A. glacialis* form chief food of *Solaster papposus* and *S. endeca*; GRIEG (49) p. 6.—*Astronyx loveni* feeds on *Pennatulæ*; SMITH (153) p. 169.—Holothurians do not eat living coral; THURSTON (158) p. 101.

(v) **Defence and Protection**:—(b) Concealment,—Protection by adhering sea-weed evolved, or was evolved from, use of sea-weed as brood-pouch in *Hipponoë variegata*; BATHER (5).

(vi) **Locomotion**:—Floating of *Antedon* several feet above sea-bottom; BATHER (6).—Probable free locomotion of *Herpetocrinus*; BATHER (8) p. 217.

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(vii) **Autotomy and Regeneration** :—Autotomy due to parasitic *Myzostoma* in *Asterias richardi* and *Stolasterias neglecta*; MARENZELLER (104) p. 135.—Relation of autotomy to sexual reproduction, and anatomy of comet-form in *Linckia*; HIROTA (60).—Reproduction by median fission in *Stichaster insignis* and *Tarsaster neozelanicus*, described and illustrated; FARQUHAR (37) pp. 204 & 208.

Regenerate arms in *Holocrinus*; KOENEN (81) p. 291.

(viii) **Parasites and Commensals** :—*Myzostoma* in arms of *Asterias* and *Stolasterias*; MARENZELLER (103): (see also II, D, vii).—*Myzostoma cirriferum* on *Antedon petasus*; GRIEG (49) p. 5.—Copepod (*Cancerilla tubulata*) on *Ophiocoma nigra* or *Ophiothrix fragilis*; HERDMAN (55) p. 49.—Polychæt (*Phalacrostemma cidariophilum*) tubes on spines of *Dorocidaris papillata* in Mediterranean; MARENZELLER (102).

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(ix) **Echinoderms as food for Fish** :—*Ech. Ast. Oph. Hol.* in stomachs of *Pleuronectes platessa*, *P. microcephalus*, *P. limanda*, *P. cynoglossus*, *Hippoglossoides limandoides*, *Trigla gurnardus*, *Gadus morrhua*, *G. æglefinus*, *G. merlangus*, and *Anarrhichas lupus*; SMITH (154).—Proportions and constituents of Echinoderm diet of *Pleuronectes limanda*, *P. flesus*, *Gadus merlangus*, *G. æglefinus*, and *Trigla gurnardus*; HERDMAN & SCOTT (56) pp. 114–124.

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(iii) **Bibliography** :—of N. American fossil Echinoderms; KEYES (71).—Of Echinoderm Spermatogenesis; FIELD (38) p. 262.—Chief writings on fossil *Echinoderma*; ZITTEL (180) pp. 114, 148, 158, & 174.—Literature of 1894, listed and partially abstracted; LUDWIG (91).—Liste chronologique des travaux scientifiques publiés par Gustave Cotteau; PERON (132).—Appreciation of G. H. Cotteau's work on *Echinoidea*; DEGRANGE-TOUZIN (32).

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(F.) AUXOLOGY.

(i) *ECHINODERMA* :—(a) Evidence from Echinoderm larvæ as to origin of *Metazoa* and *Cœlomata*, and as to recapitulation of ancestral history ; MACBRIDE (95).—Phylogeny inferred from Ontogeny, relations of *Cystidea*, homologies with *Enteropneusta*; BURY (17) pp. 88–131.

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(d) Oviposition and fertilisation :—Karyokinesis of fertilised ovum, quadrille of centres denied for species of *Toxopneustes*, *Arbacia*, and *Asterias* ; WILSON & MATHEWS (175).

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(e) Larva of *Asterias vulgaris*, water-pores and præoral lobe ; WILLEY (171) p. 253.—Metamorphosis of *Bipinnaria asterigera* (pp. 65–71), of *Brachiolaria* (pp. 71–74); BURY (17).

(g) Growth stages of *Luidia sarsi* ; MARENZELLER (104) p. 132.—Brephic and neanic stages, *Asterias tomidata* (p. 553), *Asterina fimbriata* (p. 594), *Odontaster* sp. (p. 630) ; LEIPOLDT (84).—Neanic stages of *Porania insignis* (p. 138), senile *Poraniomorpha spinulosa* (p. 139) ; VERRILL (164).

(v) *OPHIUROIDEA* :—(c) Development of axial and aboral sinus, ovoid gland, lacunar system, and gonads in *Ophiothrix* ; RUSSO (142).

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(e) Early stages of *Amphiura squamata* not abnormal as Russo says ; MACBRIDE (95) p. 335.—Metamorphosis of the *Pluteus* ; BURY (17) pp. 83–86.

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(vii) **Experimental investigation** :—

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III. DISTRIBUTION.

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(i) GENERAL.

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(ii) ATLANTIC AND ADJACENT SEAS.

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Fjords of Iceland,—*Hol.*, *Ech.*, *Ast.*, *Oph.*; LUNDBECK (93) pp. 172 & 176.—Norway, fjords near Bergen, annotated list of *Echinoderma*; GRIEG (49).—Herlöfjord, list of *Echinoderma*, with some account of bottom; APPELLÖF (2).

Scotland, W. coast,—*Ast.*, *Oph.*, *Hol.*, *Ech.*, dredged, esp. *Echinocyamus* "among shore species"; SMITH (153).—E. coast, Smith's Bank, *Echinus acutus*; SIM (149).

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(iv) PACIFIC AND ADJACENT SEAS.

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New Zealand, list of Echinoderms, with their general distribution and remarks on same; FARQUHAR (37).

(v) ARCTIC OCEAN AND ADJACENT SEAS.

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B.—GEOLOGICAL.

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List of Pyrenees fossils from Ordovician to Pliocene, with localities and horizons, *Ech.*, *Crin.*, *Cyst.*; ROUSSEL (138) pp. 2–40 & 279–297.

(ii) Cainozoic.

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(b) **Post-pliocene**: — Sicily, *Astrogonium* (*Petalastrum*) *propegeometricum*, n. sp.; GREGORIO (48).—Calabria, *Echinocyamus*; CORTESE (22) p. 178.

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(f) **Eocene** :—Calcare di Gassino, Italy, list of *Ech.*, *Ast.*, *Crin.*; TRABUCCO (161) p. 117.—Upper Eocene (*Serpula spirulaea* beds) Venetia, *Echinoidea* and *Pentacrinus subbasaltiformis*; GREGORIO (47) pp. 14–17.—Eocene? Marl, Chickasawhay river, Clarke co., Mississippi, Holothurian spicules figured; CUNNINGHAM (30).—(Upper Maude beds and Waurn Ponds) Victoria, list of *Echinoidea*; HALL & PRITCHARD (52) p. 184.—(Oamaru), New Zealand, *Echinoidea and Crinoidea* compared with Australian Eocene *Echinoderma*; TATE (157).

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Upper Cretaceous.—(Fox Hills Group), Colorado, *Scutellaster cretaceus*, n. g. & sp.; CRAGIN (29).—(Senonian),—Rügen, *Ech.*, *Ast.*, *Oph.*, and *Crin.*, critical list and remarks; DEECKE (31) p. 71: Persian *Echinoidea* allied to contemporaries, not of India, but of Algeria, Tunis, Spain, and Provence, proving extension of Mediterranean into Persia, *Hemipneustes*, *Holaster*, *Iraniaster*, *Hemiaster*, *Opissaster*, *Ornithaster*, *Pygurostoma*, *Parapygus*, *Catopygus*, *Pseudocatopygus*, *Vologesia*, *Echinobrissus*, *Pyrina*, *Echinoconus*, *Holectypus*, *Coptodiscus*, *Cidaris*, *Salenia*, *Hemipedina*, *Orthopsis*, *Cyphosoma*, *Coptosoma*, *Actinophyma*, *Orthechinus*, *Goniopygus*, *Plistophyma*; COTTEAU & GAUTHIER (27) p. 107.—(Cenomanian),—Calabria, *Hemiaster gracilis*; CORTESE (22) p. 114: Persian *Echinoidea* compared with those of Algeria, *Pseudananchys*, *Hypeaster*, *Hemiaster*; COTTEAU & GAUTHIER (27) p. 13.—(Priesener Schichten),—Zone of *Inoceramus cuvieri* at Tetschen, Bohemia, *Holaster planus*; MATOUSCHEK (106): Bohemia, Klein-Kahn, *Micraster*, *Antedon* (p. 145), Neugründel, *Cidaris*, *Stellaster* (p. 147), Kunětitzer Berg, *Holaster* (p. 163), Holitz, *Cidaris*, *Catopygus*, *Holaster* (p. 165), Nemoschitz, *Antedon*, *Cyphosoma*, *Micraster*, *Holothuria*? (p. 168), Jestbořitz, *Antedon*, *Stellaster*, *Holaster* (p. 169), Kalouschka, *Antedon*, *Holaster*, *Micraster*, *Holothuria*? (p. 180); JAHN (69).—(Teplitzer Schichten), Bohemia, Kočí, *Cidaris*, *Phymosoma*, *Stellaster*; JAHN (69) p. 214.—List of *Echinoidea* in Chalk of Jičína, Bohemia; ZAHÁLKA (178): and of Ripu, Bohemia; ZAHÁLKA (177).

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(c) Jurassic:—Aquitaine, lists of *Ech.* and *Crin.* with localities and horizons; GLANGEAUD (44).

Upper Jurassic.—(Tithonian), Campora, Lombardy, *Metaporhinus*, *Collyrites*, *Phylloricrinus* [sic], *Pentacrinus* [= *Balanocrinus*]; CORTI (23) p. 186: *Metaporinus*, *Collyrites*, *Phyllocrinus*, *Pentacrinus*; CORTI (24) p. 386.—(Malm), Pomerania, *Echinoidea*, with localities; DEECKE (31) p. 24.—(Virgulien), Cirin in Ain, *Antedon*, *Plutonaster*, and *Pentagonaster chantrei*, n. sp.; LORIOL (88).—(Corallien inférieur ou Glypticien), Commercy, Meuse, list of *Ech.* and *Crin.*, esp. *Hemicidaris crenularis*, *Collyrites bicordata*, and *Millericrinus munsterianus*; PERON (131).—(Rauracien), Istein in Baden, *Cidaris florigemma*, *Glypticus hieroglyphicus*, *Hemicidaris intermedia*, *Apiocrinus*, *Pentacrinus censoriensis* (?); MIEG (112) p. 102.—(Rauracien inférieur), Jura Bernois, list of *Ech.* and *Crin.*; LORIOL (87) pp. 89–91.—(Callovian),—N.W. France, lists of *Echinoidea* from various localities; BIZET (13).

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—(Bathonian) near Toulon, localities and horizons of *Ech.*, with *Heteropedina moteti*, n. g. & sp., also *Millericrinus morierei* and *Pentacrinus nicoleti*; MICHALET (111).—(*Humphresianus* zone and Hauptrogenstein), Tuniberge near Freiburg i. B, occurrence of *Galeropygus caudatus*, *Rhabdocidaris horrida*, and *Echinobrissus renggeri*, *Pseudodiadema pentagonum*, *Pentacrinus cristagalli*; SARDESON (144) pp. 113 & 116.

(d) **Lias**:—(Limestone with *Phylloceras cylindricum*), Mt. Pisano, Italy, *Pentacrinus*, *Cidaris*, *Diademopsis*; FUCINI (40) pp. 140–143.—(Lower Lias), Saltrio in Lombardy, *Millericrinus*, *Pentacrinus*, *Cidaris*; PARONA (129) pp. 70–73.

(iv) PALÆOZOIC.

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(b) **Trias**:—Tuscany, *Encrinus liliiformis*, *E. silesiacus* ?, *Cidaris transversa*; NOVARESE (126).—(Muschelkalk),—Italy, *Pentacrinus*, *Encrinus*, *Cidaris*, various localities; TOMMASI (160) pp. 57–63: (Gorasdzer Schichten), Upper Silesia, *Encrinus spinosus*, n. sp.; MICHAEL (110).—(Cassianer Schichten), Marmolatagebirge, *Cidaris*, *Encrinus* (pp. 83 & 84), and (Marmolatakalk), *Encrinus*, *Pentacrinus*, *Cidaris* (p. 138); SALOMON (143).

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(Kaskaskia Group), Kentucky, n. spp. of *Onychocrinus*, *Poteriocrinus*, *Pterotocrinus*, *Taxocrinus*, and *Zeacrinus*; MILLER (114).

(St. Louis Group),—Indiana, n. spp. of *Batocrinus*; MILLER (114): Alton, Ill., n. spp. of *Poteriocrinus*, *Cyathocrinus*; MILLER (115).

(Keokuk Group),—Kentucky, Tennessee, Illinois, and Indiana, n. spp. of *Actinocrinus*, *Agaricocrinus*, *Barycrinus*, *Batocrinus*, *Eretmocrinus*, *Platycrinus*; MILLER (114): Button Mould Knob, Ky., n. sp. of *Batocrinus*, MILLER (115): Boonville, Mo., n. spp. of *Batocrinus*, *Zeacrinus*; MILLER (115).

(Burlington and Keokuk), accurate horizons of *Crin.* and *Blast.* in Missouri; WELLER (165) p. 198.

(Burlington Group),—Sedalia, Mo., n. spp. of *Batocrinus*, *Shumardocrinus*, n. g., *Strotocrinus*, *Actinocrinus*, *Poteriocrinus*, *Cyathocrinus*, *Platycrinus*; MILLER (115).—(Upper Burlington Limestone), *Granatocrinus magnibasis*, n. sp.; ROWLEY (140) p. 220.

(Kinderhook Group),—*Allagecrinus americanus*, n. sp.; ROWLEY (140) p. 219.

(Chouteau Limestone),—Sedalia, Mo., n. spp. of *Actinocrinus*, *Samp-*

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sonocrinus, n. g., *Amphoracrinus*, *Melocrinus*, *Poteriocrinus*, *Cyathocrinus*, *Platycrinus*, *Codaster*; MILLER (115): *Crin.* and *Blast.* of circum-insular habitat; WELLER (166) p. 910.

(f) **Devonian**:—Limestones of Lummaton and Wolborough in S. Devon, *Crinoidea* described; WHIDBORNE (168).—Columnals from Devonian of Elba ascribed to *Actinocrinus tenuistriatus*; STEFANI (155).—(Mid-Devon., Stringocephalen-kalk), Rhineland, list and localities of *Crinoidea* and *Pentatremites*; HOLZAPFEL (61) pp. 299–316.—Germany, *Crinoidea* and a *Blastoid*, occurrence discussed, with special reference to Lower Devon. Hunsrückschiefer; JAEKEL (67) *passim*, esp. p. 4.—(Lower Devon.) E. Ural, n. spp. ascribed to *Callicrinus*, *Lahuseniocrinus*, n. g., and *Gissocrinus*, also *Condylocrinus verrucosus*; TSCHERNYSCHEW (162) p. 186.

(Hamilton Group),—Clarke Co., Ind., n. spp. of *Megistocrinus*; MILLER (115): Charleston, Ind., n. spp. of *Gilbertsocrinus*, *Dolatocrinus*; MILLER (114): n. spp. of *Dolatocrinus*; MILLER (115).

(g) **Silurian**:—(Niagara Group),—Louisville, Ky., n. sp. of *Caryocrinus*; MILLER (114): Decatur Co., Tenn., n. spp. of *Thalamocrinus*, n. g.; MILLER (115): Madison, Ind., n. spp. of *Holocystites*; MILLER (115): St. Paul, Ind., n. spp. of *Saccocrinus*, *Cylicocrinus*, *Macrostylocrinus*, *Emperocrinus*, n. g., *Stribalocystis*; MILLER (114): n. spp. of *Pisocrinus*, *Indianocrinus*, n. g.; MILLER (115).

(h) **Ordovician**:—(Uppermost Hudson R. Group), Indiana, *Agelacrinus faberi*, n. sp.; MILLER & FABER (113) p. 156.—(Hudson R. Group), Alexander Co., Ill., n. sp. of *Cyclocystoides*; MILLER (114).

(Trenton Group), Knox Co., Tenn., n. sp. of *Archæocrinus*: Mercer Co., Ky., n. sp. of *Pleurocystis*; MILLER (114).

(i) **Cambrian**:—(Mid-Cambrian), Coulouma in l'Hérault, *Trochocystis cannati*, n. sp.; MIQUEL (116) p. 9.

IV. SYSTEMATIC.†

(A.)—ECHINODERMA IN GENERAL.

Systematic review of *Echinoderma* and of Classes, with special reference to extinct forms; three main divisions *Pelmatozoa*, *Asterozoa*, and *Echinozoa*; ZITTEL (180).

† A dagger prefixed to the trivial name of a species indicates that it is fossil; prefixed to the name of the author, it denotes that the reference is to the species in a fossil state; prefixed to the name of a genus, it indicates that all species of the genus here recorded are fossil, and the † is therefore not repeated before each name. The abbreviations *l. c.* and *op. cit.* refer only to the place or work quoted *immediately* before.

A name and reference quoted without further statement (*e.g.*, *Ankyroderma jeffreysii*, above) indicate that the original author's statement refers merely to locality or some question of slight importance. Further information can usually be gleaned from the cross-references under TITLES.

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Incertæ sedis.

†*Pegmacrinus*, Virgulien, Cirin, figured, but are probably not *Echinoderma* ; LORIOL (88).

Vide etiam *Rhizocrinus santagatai*.

(B.)—HOLOTHURIOIDEA.

Actinocucumis typica ; KOEHLER (77) p. 380 ; young, spicules described ; KOEHLER (73) p. 276.

Ankyroderma jeffreysii ; SLUITER (152) p. 82.

"*Auricularia nudibranchiata*," a new form of Holothurian larva from Orotava ; CHUN (21).

Chirodota liberata ; SLUITER (152) p. 82. *C. pellucida*, excretion ; SCHULTZ (147) p. 391. *C. rufescens* ; SLUITER (152) p. 82.

Colochirus, maintained ; KOEHLER (76) p. 358. *C. cucumis*, *C. doliolum* ; SLUITER (152) p. 80. *C. quadrangularis* ; KOEHLER (77) p. 375 ; SLUITER (152) p. 80. *C. scandens* ; *l. c.* *C. tuberculosus* ; *C. violaceus*, Biliton Id. ? ; KOEHLER (77) p. 375.

Cucumaria, subgenera discussed, and key to species given ; KOEHLER (76) pp. 358 & 360. *C. canescens* ; KOEHLER (77) p. 376 ; SLUITER (152) p. 80. *C. cucumis* ; *l. c.* : spermatogenesis ; FIELD (38) ; diagnosed ; KOEHLER (76) p. 362. *C. elongata* ; SLUITER (152) p. 80 : diagnosed ; KOEHLER (76) p. 362. *C. frondosa* ; GRIEG (49) p. 4 ; SLUITER (152) p. 80 : spicules described and figured ; KOEHLER (76) p. 361. *C. glacialis* ; SLUITER (152) p. 80. *C. grubii*, diagnosed ; KOEHLER (76) p. 363. *C. hispida* ; GRIEG (49) p. 4. *C. hyndmani* ; *l. c.* ; SLUITER (152) p. 80 : spicules figured ; KOEHLER (76) p. 361. *C. imbricata* ; KOEHLER (77) p. 376. *C. japonica* ; SLUITER (152) p. 80. *C. kirschbergii*, spicules described and figured (p. 360) ; *C.* (*Semperia*) *köllikeri*, diagnosed (p. 363) ; KOEHLER (76). *C. lactea* ; SLUITER (152) p. 80 : includes *C. mosterensis* ; GRIEG (49) p. 4 : diagnosed ; KOEHLER (76) p. 363. *C.* (*Semperia*) *lefevrei*, spicules figured ; KOEHLER (76) p. 364. *C. mirabilis*, covered with shells, spicules of podia perforate ; SLUITER (152) p. 80. *C. montagui*, referred to *Colochirus* and distinguished from *C. lefevrei*, which is a *Semperia*, and from *C. elongata* ; KOEHLER (76) pp. 355 & 360. *C. pentactes* ; GRIEG (49) p. 4 : excretion ; SCHULTZ (147) p. 394. *C. planci* ; SLUITER (152) p. 80 : spicules figured ; KOEHLER (76) p. 364 ; spermatozoon ; BALLOWITZ (3). *C.* (*Semperia*) *syracusana*, diagnosed ; KOEHLER (76) p. 363. *C. tergestina* ; SLUITER (152) p. 80 : spicules and arrangement of podia figured ; KOEHLER (76) p. 362.

Echinocucumis typica ; SLUITER (152) p. 80.

Elpidia glacialis ; SLUITER (152) p. 81.

Haplodactyla molpadoides, *H. punctata* ; *l. c.*

Holothuria, key to species ; KOEHLER (76) p. 364. *H. argus*, "Anus très distinctement stellé" ; KOEHLER (73) p. 279. *H. atra* ; KOEHLER (77) p. 382 : stone-red in life ; SLUITER (152) p. 78. *H. cap-*

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tiva (p. 79), *H. curiosa* (p. 78); SLUITER (152). *H. edulis*; KOEHLER (73) p. 281, and SLUITER (152) p. 79. *H. erinaceus* (p. 78), *H. flavo-maculata*, includes *H. fusco-cærulea*, Theel (p. 77); SLUITER (152). *H. forskali*, confused with *H. polii* by Naples Station, diagnosed; KOEHLER (76) pp. 357 & 365. *H. fuscocinerea* (p. 79), *H. glaberrima* (p. 78); SLUITER (152). *H. graeffei*, Semper's description confirmed; KOEHLER (73) p. 280. *H. helleri*, diagnosed; KOEHLER (76) p. 365. *H. immobilis*; SLUITER (152) p. 78. *H. impatiens*, *l. c.*; KOEHLER (73) p. 282: diagnosed; KOEHLER (76) p. 364. *H. intestinalis*; GRIEG (49) p. 4; MARENZELLER (104) p. 143; SLUITER (152) p. 78. *H. klunzingeri*, allied to *H. notabilis*; *l. c.* *H. maculata*; SLUITER (152) p. 79. *H. mammata*, discussed; KOEHLER (76) p. 366. *H. marmorata*; SLUITER (152) p. 78. *H. martensi*, spicules described; KOEHLER (77) p. 383. *H. monacaria*; KOEHLER (73) p. 281; (77) p. 381; SLUITER (152) p. 77. *H. notabilis*, *H. olivacea*, *H. ozurropa*; SLUITER (152) p. 78. *H. pardalis*; KOEHLER (73) p. 283; (77) p. 381; SLUITER (152) p. 79. *H. pleuripus*, spicules described; KOEHLER (73) p. 283. *H. poli*; SLUITER (152) p. 78: diagnosed; KOEHLER (76) p. 365: spermatogenesis; FIELD (38). *H. pulchella*; SLUITER (152) p. 77. *H. pyxis*; *l. c.* *H. sanctori*, diagnosed; KOEHLER (76) p. 365. *H. scabra* (p. 78); *H. squamifera* (p. 79); SLUITER (152). *H. stellati*; *op. cit.* p. 78: distinguished from *H. tubulosa*, those of Naples Station are *H. polii*; KOEHLER (76) p. 366. *H. surinamensis*; SLUITER (152) p. 78. *H. tremula*; *op. cit.* p. 79; GRIEG (49) p. 4: spicules described and figured; KOEHLER (76) p. 366. *H. truncata*; SLUITER (152) p. 79. *H. tubulosa*; *l. c.*: spicules described and figured; KOEHLER (76) p. 366; *H. vagabunda*; KOEHLER (73) p. 284; SLUITER (152) p. 77: perhaps includes *H. lagoena*; KOEHLER (77) p. 383. *H. vitiensis*; SLUITER (152) p. 78: includes *H. tenuissima*, Semper; KOEHLER (77) p. 383.

Muelleria flava-castanea (?) twice as large as type; SLUITER (152) p. 79. *M. lecanora*; *l. c.*; *M. mauritiana*; *l. c.*; KOEHLER (77) p. 380. *M. miliaris*; SLUITER (152) p. 79.

Myriotrochus rinkii; GRIEG (49) p. 4; SLUITER (152) p. 82.

Ocnus suppressed; KOEHLER (76) p. 359. *O. javanicus*; SLUITER (152) p. 80.

Orcula tenera; SLUITER (152) p. 81.

Phyllophorus granulatus, *P. holothuroides*; SLUITER (152) p. 81. *P. occidentalis*, spicules first figured; KOEHLER (77) p. 377. *P. pellucidus*; GRIEG (49) p. 4.

P. bedoti, B. of Amboyna; KOEHLER (73) Rev. Suisse Zool. iii, p. 278, n. sp.

Pseudocucumis acicula, double spicules; SLUITER (152) p. 81. *P. africana*; KOEHLER (73) p. 276. *P. intercedens*, includes *Cucumaria bicolor*, Bell; KOEHLER (77) p. 378.

Pseudostichopus occultatus; MARENZELLER (104) p. 143.

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Psolus phantapus ; GRIEG (49) p. 4 ; SLUITER (152) p. 81. *P. regalis* ; *l. c.* *P. squamatus* ; *l. c.* ; GRIEG (49) p. 4.

Semperia, see under *Cucumaria*.

Stichopus chloronotus ; KOEHLER (73) p. 285 ; (77) p. 385 ; SLUITER (152) p. 79. *S. levis* ; *l. c.* *S. natans* ; GRIEG (49) p. 4. *S. regalis* ; MARENZELLER (104) p. 143 ; SLUITER (152) p. 79 : spermatogenesis ; FIELD (38). *S. sitchaensis* ; SLUITER (152) p. 79. *S. variegatus* ; *l. c.* ; KOEHLER (77) p. 384. *S. vastus* ; SLUITER (152) p. 79.

Synapta, development ; BURY (17) pp. 47–64. *S. beseli* ; KOEHLER (73) p. 285 ; SLUITER (152) p. 82. *S. buski*, Bell's figures criticised, species perhaps indistinguishable from *S. inhaerens* ; CHADWICK (20) p. 236. *S. digitata* ; MARENZELLER (104) p. 144 ; SLUITER (152) p. 82 : Bell's description of tentacles criticised ; CHADWICK (20) p. 236. *S. dubia*, *S. glabra*, *S. godefroyi*, *S. grisea*, *S. indivisa* ; SLUITER (152) p. 82. *S. inhaerens* ; *l. c.* ; GRIEG (49) p. 4 : Bell's figures criticised, anatomy and histology described ; CHADWICK (20). *S. kefersteinii*, *S. lactea*, *S. psara* ; SLUITER (152) p. 82. *S. recta* ; KOEHLER (77) p. 385. *S. reticulata* ; *l. c.* ; KOEHLER (73) p. 286 ; and with var. *maculata* ; SLUITER (152) p. 82. *S. rodea* ; *l. c.*

Thyone fusus ; GRIEG (49) p. 4. *T. mirabilis*, variations from type ; KOEHLER (77) p. 378. *T. raphanus* ; GRIEG (49) p. 4. *T. sacella* ; SLUITER (152) p. 80.

Thyonidium rigidum, Indian Archipelago ; SLUITER (152) Bijdr. Dierk. xvii, p. 80, n. sp.

Trochostoma arcticum (p. 82), *T. boreale* (p. 81) ; SLUITER (152).

(C.)—ECHINOIDEA.

General account, and classification of fossil forms thus : Subclass, *Palechinoidea*, with Orders, *Cystocidarida*, *Bothriocidarida*, *Perischoechinida* ; Subclass, *Euechinoidea*, with Orders, *Regulares* (*Holostomata*, *Glyphostomata*), *Irregulares* (*Gnathostomata*, *Atelostomata*) ; ZITTEL (180) p. 174.

†*Actinophyma*, n. g. of *Diadematidæ* (p. 96), with type *A. spectabile*, Senonian of Endjirkouh, Lauristan (p. 98) ; COTTEAU & GAUTHIER (27) Ech. foss. Perse, n. sp.

†*Adytaster*, introduced as "Lambert, 1895," but apparently n. g, with type *Cyclaster lucentinus*, Cotteau ; LAMBERT (88) p. 162.

†*Agassizia lovisatoi*, Miocene, "Calcaire compacte de Fontanazzo," Eo- Sardinia ; COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, *Elpidi*- ém. No. 13, p. 49, n. sp.

Haplo- *neustes ovum*, change of proportions with age ; SLUITER (151) *Holothu*- 1.

très *otus sulcatus*, probably = *Cardiaster latecordatus* ; TATE (157) LER (7.

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†*Amphiope* :—*A. hollandei*, slight variation from type, Sardinia ; COTTEAU (26) p. 16.

A. dessii, [ascribed to "Lovisato, 1895," but apparently n. sp.], Miocene under the Camposanto of Nurri, Sardinia (p. 17) ; *A. lovisatoi*, Miocene near Chiaramonti, Sardinia (p. 16) ; COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13 : n. spp.

Arachnoides :—†*A. conica* is a *Monostychia*, probably *M. australis* var. *loveni* ; TATE (157) p. 123. *A. placenta* ; SLUITER (151) p. 72 : distribution ; FARQUHAR (37) p. 197.

Arbacia dufresnei, resembles *A. alternans*, carries its young ; BERNARD (12). *A. nigra* ; SLUITER (151) p. 68. *A. punctulata* ; *l. c.* ; WILSON & MATHEWS (175). *A. pustulosa* ; KOEHLER (78) p. 224 ; SLUITER (151), p. 68 : spermatogenesis ; FIELD (38). *A. stellata* ; SLUITER (151) p. 68.

†*Arbacina* :—*A. pias*, [ascribed to "Lovisato, 1895," but apparently n. sp.], Miocene near Cantoniera de Cadreas, Sardinia (p. 13) ; *A. sassarensis*, Miocene of C. St. Elia and Cantoniera de Cadreas, Sardinia (p. 12) ; COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13 : n. spp.

†*Archæocidaris* :—*A. aculeata*, refigured (p. 130), *A. agassizi*, refigured (p. 127), *A. biangulata*, refigured (p. 130), *A. dininnii* (p. 130), *A. hallianus*, Geinitz, olim *Eocidaris* (p. 129), *A. keokuk* (p. 128), *A. megastylus*, refigured (p. 129), *A. newberryi* (p. 129), *A. norwoodi* (p. 129), *A. shumardana* (p. 128), *A. wortheni*, refigured (p. 128) ; KEYES (70).

Asthenosoma hystrix ; KOEHLER (78) p. 224 & (79) p. 228. *A. varium*, figures of specimen from Amboyna, with enlargements of apical system, peristome, ambulacrals, interambulacrals, spines, and pedicellariæ ; LORIOL (89).

Astriclypeus manni ; SLUITER (151) p. 73.

Astropyga radiata, has globiferous spines as in *Centrostephanus* ; KOEHLER (77) p. 412 : includes forms previously referred by Sluiter to *A. pulvinata* ; SLUITER (151) p. 68.

†*Bothriocidaris*, anatomy and place in system ; JAEKEL (66).

†*Breynella vassali*, see *Pygorhynchus*.

Brissopsis :—†*B.* sp , Miocene of Fontanazzo in Sardinia ; COTTEAU (26) p. 41. †*B. alta*, fresh details of type ; TATE (157) p. 124. †*B. crescenticus* ; MAZZETTI (108) p. 436 : variations from type, Sardinia ; COTTEAU (26) p. 41. †*B. hectori*, invalid ; TATE (157) p. 124. *B. luzonica* ; KOEHLER (77) p. 418. *B. lyrifera* ; GRIEG (49) p. 11 ; KOEHLER (78) p. 225 & (79) p. 230 ; MARENZELLER (104) p. 143. †*B. lyriphera* [sic] ; MAZZETTI (108) p. 435. †*B. ottnangensis* ; MAZZETTI (108) p. 436 ; PROCHÁZKA (134) pp. 8, 10, 13, 17, & 23.

Brissus :—†*B.* sp. ; MAZZETTI (108) p. 436. *B. carinatus* ; SLUITER (151) p. 74. †*B. corsicus*, Sardinia ; COTTEAU (26) p. 50. †*B. eximius* ; TATE (157) p. 124. *B. unicolor* ; SLUITER (151) p. 74.

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†*Caratomus nuperus* is an *Echinolampas*, aff. *E. gambierensis*; TATE (157) p. 123.

†*Cardiaster*:—*C. granulosus*, discussed, with allies *C. sequanicus*, *C. sarthacensis*; LAMBERT (83) p. 265. *C. latecordatus*, see *Amphidotus sulcatus*.

†*Catopygus*:—*C. morgani* (p. 60) & *C. ovalis* (p. 61), Senonian of Derre-i-Chahr, Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse: n. spp.

Centrostephanus longispinus, test redescribed and figured; KOEHLER (75) p. 339.

Cidaris:—†*C.* (*Rhabdocidaris*) sp., Eocene of Waihao R., N.Z.; TATE (157) p. 122. †*C. alpina*; TOBLER (159) p. 254. †*C.* cf. *amalthei*, spines; PARONA (129) p. 73. †*C. avenionensis*; MAZZETTI (108) p. 417: from Sardinia, variations in spines described; COTTEAU (26) p. 7. †*C. belgica*; MAZZETTI (108) p. 417. †*C. hirta*; *l. c.* †*C. hollandei*, redescribed and figured, from Sardinia; COTTEAU (26) p. 6. †*C. melitensis*; MAZZETTI (108) p. 417. *C. metularia*; SLUITER (151) p. 67. †*C. munsteri*, Sardinia; COTTEAU (26) p. 8. *C. papillata*; GRIEG (49) p. 10; MAZZETTI (108) p. 417. †*C. peroni*, syn. of *C. munsteri*; COTTEAU (26) p. 8. †*C. pleracantha*, discussed; LAMBERT (83) p. 261. †*C. propinqua*, doubtful if spines referred here really belong to test; PERON (131) p. 544. †*C. striata*, probably *Leiocidaris australiæ*; TATE (157) p. 122. †*C. terrenzii*; FUCINI (40) p. 141. †*C. transversa*; NOVARESE (126): spines figured and described, Muschelkalk, Lenna, Italy; TOMMASI (160) p. 62. *C. tribuloides*; KOEHLER (78) p. 224; SLUITER (151) p. 67. †*C. triserrata*, spine-fragments, figured; SALOMON (143) p. 138. †*C.* (*Leiocidaris*) *verneuilli*, includes *C. pseudojurassica* and *C. scampicii*, found in Italy, figured; GREGORIO (47) p. 14. †*C. verticillum*; MAZZETTI (108) p. 417. See also *Leiocidaris*, *Rhabdocidaris*.

†*C.*, indet. spine-fragment, Cassian beds, Oberes Fassathal; SALOMON (143) Palæontogr. xlii (1–3) p. 83. †*C.*, indet., Marmolata; *op. cit.* p. 139. †*C. aftabensis*, based on spines from Senonian of Aftab, Derre-i-Chahr, and Kolm, Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 81. †*C. husseini* [ascribed to "Cott. & Gauth. 1894," but apparently n. sp.], Senonian of Derre-i-Chahr, Louristan; *op. cit.* p. 82. †*C. lovisatoi* [ascribed to "Cotteau, 1893," but apparently n. sp.], Miocene of Monteleone, Sardinia; COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13, p. 9. †*C. persica*, Senonian of Aftab, Derre-i-Chahr, and Endjir-Kouh, Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 79: n. spp.

Clypeaster:—†*C.* sp., Miocene of S. Bartholomeo near Cagliari, Sardinia; COTTEAU (26). †*C. alticostatus*; CORTESE (22) p. 142. †*C.*, aff. *alticostatus*, Miocene of Sardinia; COTTEAU (26) p. 29. †*C. altus*, Sardinia; *op. cit.* p. 23. †*C. crassicostatus*, Sardinia; *l. c.* †*C. gibbosus*; CORTESE (22) p. 141: large size and broad ambulacra,

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also var. *dilatata*, Sardinia ; COTTEAU (26) p. 20. †*C. humilis* ; MAZZETTI (107) p. 219 ; SLUITER (151) p. 72. †*C. insignis*, var. *acuminatus* ; CORTESE (22) p. 142. †*C. intermedius* ; *l. c.* : a large individual, Sardinia ; COTTEAU (26) p. 24. †*C. marginatus*, slight variations from type in Sardinian specimens ; COTTEAU (26) p. 21. †*C. michelini* (p. 141), †*C. philippii* (p. 142), †*C. planatus* (p. 143), †*C. pliocenicum* (p. 171), †*C. portentosus* (p. 142), †*C. pyramidalis* (p. 142) ; CORTESE (22). †*C.*, aff. *reidii*, Sardinia (p. 25), †*C. scillæ*, Sardinia (p. 22), †*C. tauricus*, slight variations from type in Sardinian specimens (p. 23) ; COTTEAU (26). †*C. tenuis*, var. *gigantea* ; CORTESE (22) p. 143.

†"*Clypeaster cortesei*, Di-Stef., n. sp." (p. 142), †"*Clypeaster jonicus*, Di-Stef., n. sp." (p. 141), †"*Clypeaster subintermedius*, Di-Stef., n. sp." (p. 142), †"*Clypeaster submelitensis*, Di-Stef., n. sp." (p. 142) : nomm. nudd. ; CORTESE (22) Mem. Carta Geol. Ital. ix.

†*C. lovisatoi* (p. 26), †*C. sardiniensis* (p. 28), Miocene of Sardinia COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13 : n. spp.

Coelopleurus [written *Caelopleurus*] *equis*, Italy ; GREGORIO (47) p. 14.

†*Collyrites* :—*C. berriasensis* ; TOBLER (159) p. 265. *C. dorsalis* (p. 117) & *C. elliptica* (p. 116), described and figured, Upper Callovian of Carreaux (Orne) ; BIZET (13). *C. friburgensis*, Tithonian, Italy ; CORTI (24) p. 386.

Colobocentrotus atratus, *C. mertensii* ; SLUITER (151) p. 69.

†*Conoclypeus* :—*C. anacoreta* (p. 442), *C. bordae* (p. 443), *C. depressus* (p. 443), *C. duboisii* (p. 442), *C. montesiensis* (p. 443), *C. ovum*, figured (p. 443) ; MAZZETTI (108). *C. plagiosomus* ; *op. cit.* p. 442 : referred to *Echinolampas* ; COTTEAU (26) p. 31. *C. semiglobus* ; MAZZETTI (108) p. 442. *C. subcylindricus* ; *l. c.*

†*Coptodiscus*, n. g. of *Holectypoidæ* (p. 76), with type *C. noemiæ*, Senonian of Endjir-Kouh, Aftab, Kouh-Mapeul, Derre-i-Chahr, and Awassa, Louristan (p. 77) ; COTTEAU & GAUTHIER (27) Ech. foss. Perse, n. sp.

†*Coptosoma gemmatum*, Senonian of Derre-i-Chahr, Louristan ; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 95, n. sp.

†*Corculum corculum* ; LAMBERT (83) p. 265.

†*Cosmocyphus*, Pomel, not admitted ; COTTEAU & GAUTHIER (27) pp. 94 & 97.

†*Cyclaster*, discussed and defined ; LAMBERT (83) p. 160. *C. posita*, see *Heniaster*.

†*Cyphosoma* :—*C. persicum*, Derre-i-Chahr (p. 91), *C. speciale*, Awassa and Aftab (p. 93), Senonian of Louristan ; COTTEAU & GAUTHIER (27) Ech. foss. Perse : n. spp.

Diadema setosum ; KOEHLER (77) p. 410 ; SLUITER (151) p. 68.

†*D. calarense*, based on fragments of spines possibly belonging to *D. saheliensis*, from Miocene of Sardinia ; COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13, p. 14, n. sp.

†*Diademopsis*, aff. *haeri* ; FUCINI (40) p. 143.

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†*Discoides inferus*, perhaps syn. of *D. minimus* ; LAMBERT (83) p. 262.

Dorocidaris alcocki ; ALCOCK (1). *D. papillata* ; KOEHLER (78) p. 224 & (79) p. 228 ; MARENZELLER (104) p. 142 : commensal polychæt ; MARENZELLER (102). *D. tiara* ; ALCOCK (1).

Echinanthus :—†*E. angulatus* ; MAZZETTI (108) p. 437. †*E. corsicus*, Cotteau, referred to *Pliolampas vassali* ; COTTEAU (26) p. 38. †*E. marginatus* ; MAZZETTI (108) p. 437. *E. rosaceus*, *E. testudinarius* ; SLUITER (151) p. 72.

Echinarachnius excentricus, *E. mirabilis* ; *l. c.* *E. parma*, KOEHLER (78) p. 225.

†*Echinobrissus* :—*E. micraulus* (p. 118) & *E. pulvinatus* (p. 117), described and figured, Upper Callovian of Correaux (Orne) ; BIZET (13). *E. papillosus*, see *Nucleolites*.

E. iranicus, Senonian of Aftab and Derre-i-Chahr, Louristan ; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 67, n. sp.

Echinocardium australe, the New Zealand form, a well-marked variety, possibly species *E. zealandicum*, Gray ; FARQUHAR (37) p. 196. *E. cordatum* ; GRIEG (49) p. 11 ; SLUITER (151) p. 74 : spermatogenesis ; FIELD (38). *E. flavescens* ; GRIEG (49) p. 11 ; SLUITER (151) p. 74. *E. mediterraneum*, distribution extended to coast of Portugal ; KOEHLER (79) p. 230. *E. pennatifidum*, southern extension ; KOEHLER (78) p. 225.

†*Echinoconus* :—*E. circularis*, *E. icaunensis* ; LAMBERT (83) p. 262.

E. douvillei [ascribed to "Cott. & Gauth. 1894," but apparently n. sp.], Senonian of Derre-i-Chahr, Louristan ; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 70, n. sp.

†*Echinocorys* :—*E. vulgaris*, discussed with its varieties and allies, *E. ovatus*, *E. gravesi*, *E. gibba*, *E. scutatus*, *E. striatus*, *E. conoideus* ; LAMBERT (83) p. 263.

E. meudonensis, nom. nov. pro *E. ovatus*, Lamarck *non* Leske ; *l. c.* n. sp.

Echinocyamus annonii, Italy, figured ; GREGORIO (47) p. 15. *E. crispus*, (p. 215) & *E. elegans* (p. 216), described and figured ; MAZZETTI (107). †*E. minutus* ; CORTESE (22) p. 173. *E. pusillus* ; GRIEG (49) p. 11 ; KOEHLER (78) p. 225 & (79) p. 230 ; SLUITER (151) p. 72 ; †CORTESE (22) p. 178. †*E. siculus* ; *l. c.* †*E. studeri*, Gregory, from Malta, is not *E. studeri*, Sismonda ; COTTEAU (26) p. 19.

†*E. marioi* [ascribed to "Lovisato, 1895," but apparently n. sp.], Miocene of C. St. Elia and St. Ambrogio, Sardinia (p. 19), †*E. pseudopusillus*, Miocene, various localities in Sardinia (p. 18) ; COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13 : n. spp.

Echinodiscus auritus ; MAZZETTI (107) p. 220 ; SLUITER (151) p. 72. *E. biforis* ; *l. c.* *E. lævis* ; *l. c.*

Echinolampas :—†*E.* sp. ; GREGORIO (47) p. 16 : Miocene of Isili, Sardinia ; COTTEAU (26) p. 37. †*E. affinis* (p. 438), †*E. angulatus* (p. 438), †*E. beaumonti* (p. 441), †*E. blainvillei* (p. 441), †*E. conicus* (p. 440), †*E. depressus* (p. 437), †*E. discus* (p. 440), †*E. ellipticus* (p. 439), †*E. escheri* ? (p. 438), †*E. eurysomus* (p. 438), †*E. globulus* (p. 438),

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†*E. hemipilus* (p. 441) ; MAZZETTI (108). †*E. hemisphæricus* ; *op. cit.* p. 440 ; CORTESE (22) p. 143 : large individual, Sardinia ; COTTEAU (26) p. 32. †*E. kleini* ; MAZZETTI (108) p. 439. †*E. nuperus*, see *Caratomus*. *E. oviformis* ; SLUITER (151) p. 73. †*E. patellaris* (p. 440), †*E. pilus* (p. 441) ; MAZZETTI (108). †*E. plagiosomus*, olim *Conoclypeus*, Sardinia ; COTTEAU (26) p. 31. †*E. productus* (p. 439), †*E. rostratus* (p. 439), †*E. scutiformis* (p. 440), †*E. similis* (p. 438), †*E. sphæricus* (p. 440), †*E. stelliferus* (p. 442) ; MAZZETTI (108). †*E. studeri* ; *op. cit.* p. 440 : mentioned by Marmora as from Calcaire grossier of Pirri, Sardinia, is not that species ; COTTEAU (26) p. 37. †*E. subangulatus* (p. 438), †*E. subcylindricus* (p. 438), †*E. subellipticus* (p. 439), †*E. subquadrangulatus* (p. 439) ; MAZZETTI (108). †*E. subsimilis*, Italy, figured ; GREGORIO (47) p. 16.

†*E. calarensis*, Miocene of Frexenda in Cagliari, Sardinia (p. 32), †*E. lovisatoi*, Miocene of Torre de Iscale Sale near C. Mannu, Sardinia (p. 36) ; COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13. †*E. magnificus* [quoted as Mazzetti, 1888, possibly is n. sp.], Montese, Italy ; MAZZETTI (108) p. 441. †*E. pseudoangulatus*, Miocene of Sardinia (p. 35), †*E. s.-micheli* [ascribed to "Lovisato, 1893," but apparently n. sp.], Miocene "calcaire argileux," of Mt. S. Michele, Cagliari, Sardinia (p. 33), †*E. sardiniensis*, Miocene of C. St. Elia, Sardinia, varieties from Fontanazzo (p. 34) ; COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13 : n. spp.

Echinometra lucunter ; KOEHLER (77) p. 415 ; SLUITER (151) p. 69. *E. subangularis*, *E. viridis* ; *l. c.*

Echinoneus cyclostomus, *E. semilunaris* ; SLUITER (151) p. 73.

Echinothrix calamaris ; SLUITER (151) p. 68. *E. desori*, variations from type in direction of *E. calamaris* ; KOEHLER (77) p. 411. *E. turcarum* ; SLUITER (151) p. 68.

Echinus acutus ; SLUITER (151) p. 71 ; GRIEG (49) p. 11 ; KOEHLER (78) p. 225 & (79) p. 228 : distinguished in detail from *E. melo* and *E. sphæra* ; KOEHLER (75) p. 334 : E. Mediterranean, formerly referred by Marenzeller to *E. norvegicus* ; MARENZELLER (104) p. 142. *E. alexandri*, distribution extended to Spain and Azores, and to a depth of 1674 metres ; KOEHLER (79) p. 229. *E. angulosus* ; SLUITER (151) p. 71. *E. elegans* ; GRIEG (49) p. 11 ; SLUITER (151) p. 71. †*E. enysi*, probably *Psammechinus woodsi* ; TATE (157) p. 122. *E. esculentus* ; GRIEG (49) p. 11 ; SLUITER (151) p. 71. †*E.* cf. *hungaricus* ; PROCHÁZKA (134) pp. 8, 17. *E. magellanicus* ; FARQUHAR (37) p. 196 ; BERNARD (12). *E. margaritaceus*, includes *E. diadema* ; *l. c.* *E. melo* ; SLUITER (151) p. 71 : 1103 metres with brilliant colour ; KOEHLER (79) p. 228. *E. microtuberculatus* ; SEELIGER (148) ; SLUITER (151) p. 71 : spermatogenesis ; FIELD (38) : development of larva ; BURY (17) pp. 75–83 : genital system and madreporite ; RUSSO (141). *E. miliaris* ; GRIEG (49) p. 11 ; SLUITER (151) p. 71. *E. norvegicus* ; *l. c.* ; GRIEG (49) p. 11. *E. sphæra* ; KOEHLER (78) p. 225. *E. verruculatus* ; SLUITER (151) p. 71.

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Encope micropora ; SLUITER (151) p. 73.

†*Eocidaris hallianus*, referred to *Archæocidaris*; KEYES (70) p. 129.

†*Epiaster*, defined and discussed (p. 156), *E. anglicus*, Coquand, a doubtful *Micraster* (p. 220), *E. meridanensis*, discussed, considered as a *Micraster* (p. 223) ; LAMBERT (83). *E. michaleti*, see *Micraster matheroni*.

†*Eupatagus* :—*E. formosus*, see *Hemipatagus*. *E. greyi*, type described; TATE (157) p. 124. *E. tuberculatus*, see *Meoma*.

Eupatangus multituberculatus, perhaps includes *Brissopsis sowerbyiformis* of Schauroth ; GREGORIO (47) p. 16.

Evechinus chloroticus, habitat, distribution, abnormal specimen; FARQUHAR (37) p. 194.

Fibularia ovulum, *F. volva* ; SLUITER (151).

Goniocidaris canaliculata, stages of growth, includes *G. membranipora* and *G. vivipara* ; BERNARD (12).

†*Goniopygus superbus*, Senonian of Derre-i-Chahr, Awasa, and Aftab, Louristan ; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 101, n. sp.

Hemiaster :—†*H. acuminatus* ; MAZZETTI (108) p. 427. *H. australis* ; SLUITER (151) p. 74. †*H. bufo* ? (p. 428), †*H. bucklandi* ? [sic] (p. 428), †*H. cotteaui* (p. 427), †*H. declivus* (p. 427), †*H. gibbus* (p. 426), †*H. hemiglobus* (p. 427) ; MAZZETTI (108). †*H. posita* is a *Cyclaster*; TATE (157) p. 125. †*H. rostratus* (p. 426), †*H. semirostratus* (p. 427), †*H. truncatus* (p. 427), †*H. varus* (p. 426); MAZZETTI (108).

†*H. decussatus*, Cenomanian of Kebir-kouh, Louristan (p. 12), †*H. iranicus* (p. 33), †*H. longus* (p. 40), †*H. noemiæ* (p. 35), †*H. opimus* (p. 38), Senonian of Awasa, Louristan ; COTTEAU & GAUTHIER (27) Ech. foss. Perse : n. spp.

†*Hemicidaris intermedia*, probably syn. of *H. crenularis* ; PERON (131) p. 545.

†*Hemipatagus* :—*H. cordiformis* ; MAZZETTI (108) p. 437. *H. formosus* ; TATE (157) p. 123. *H. grignonensis* ; MAZZETTI (108) p. 437. *H. tuberculatus* ; TATE (157) p. 123.

†*Hemipedina noemiæ*, Upper Senonian of Endjir-Kouh, Louristan ; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 85, n. sp.

†*Hemipneustes* :—*H. italicus* ; MAZZETTI (108) p. 436.

H. minor, Aftab (p. 17), *H. persicus*, Aftab and Derre-i-Chahr (p. 15), Senonian of Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse : n. spp.

†*Heterobrissus montesii* ; MAZZETTI (108) p. 436.

Heterocentrotus mammillatus ; KOEHLER (77) p. 414 ; SLUITER (151) p. 69. *H. trigonarius* ; *l. c.*

†*Heteroclypeus* belongs to *Echinolampadæ*, not to *Conoclypeidæ* ; *H. semiglobus*, Sardinia ; COTTEAU (26) p. 30.

†*Heteropedina*, n. g., with type *H. moteti*, Upper Bathonian, "Couches à Echinides de St. Hubert, près Solliès-Toucas (Var)" ; MICHALET (111) Bull. Soc. geol. France (3) xxiii, p. 71, n. sp.

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Hipponoë esculenta ; SLUITER (151) p. 71. †***H. parkinsoni***, Sardinia ; COTTEAU (26) p. 10. ***H. variegata*** ; SLUITER (151) p. 71: protective habit ; BATHER (5).

†***Holaster*** :—***H. cordatus***, see ***Macropneustes***. ***H. planus***, in zone of ***Inoceramus cuvieri*** at Tetschen, Bohemia ; MATOUSCHEK (106) p. 119. ***H. spatangiformis***, see ***Macropneustes***.

H. iranicus, Aftab (p. 21), ***H. morgani***, Derre-i-Chahr, referred by Gauthier in footnote to ***Pseudholaster*** (p. 19), ***H. proclivis***, Aftab (p. 25), ***H. sepositus***, Derre-i-Chahr (p. 23), Senonian of Louristan ; COTTEAU & GAUTHIER (27) Ech. foss. Perse : n. spp.

†***Holectypus*** :—***H. depressus***, described and figured, Upper Callovian of Carreaux (Orne) ; BIZET (13) p. 116.

H. circularis, Derre-i-Chahr. (p. 75), ***H. inflatus*** [ascribed to "Cott. & Gauth. 1894," but apparently n. sp.], Aftab (p. 73), Senonian of Louristan ; COTTEAU & GAUTHIER (27) Ech. foss. Perse : n. spp.

†***Hypsaster***, maintained and discussed ; LAMBERT (83) p. 155.

H. kusseini (p. 9), ***H. longesulcatus*** (p. 10), Cenomanian of Kebir-kouh Louristan ; COTTEAU & GAUTHIER (27) Ech. foss. Perse : n. spp.

Ilarionia beggiatoi, Italy ; GREGORIO (47) p. 16.

†***Iraniaster***, n. g. of ***Spatangidæ*** (p. 26), with type ***I. morgani*** (p. 28), also ***I. douvillei*** (p. 30), both from Senonian clays of Awasa, Louristan ; COTTEAU & GAUTHIER (27) Ech. foss. Perse : n. spp.

†***Isaster***, defined and discussed ; LAMBERT (83) p. 159.

†***Isopneustes***, Pomel, maintained and discussed ; *l. c.*

†***Isopneustes***, Mun. Chal., syn. of ***Cyclaster*** ; *l. c.*

†***Kleinia conjuncta***, possibly a ***Toxobrissus***, but species invalid ; TATE (157) p. 124.

Laganum bonani ; SLUITER (151) p. 72 ; distinguished from ***L. depressum*** ; KOEHLER (77) p. 418. ***L. depressum*** ; SLUITER (151) p. 72. ***L. fragile***, described and figured ; MAZZETTI (107) p. 217.

†***Leiocidaris*** :—***L. australiæ***, see ***Cidaris striata***. ***L. histrix*** ; CORTESE (22) p. 173.

Linthia :—†***L. arizensis*** ? ; MAZZETTI (108) p. 435. ***L. assabensis***, described and figured ; MAZZETTI (107) p. 221. ***L. aurisleporis*** (p. 435), ***L. batyolcos*** (p. 435), ***L. capellinii***, includes ***Prenaster falax*** [sic], MAZZ. (p. 434), ***L. cavernosa*** (p. 435), ***L. cuoghii*** (434), ***L. inflata*** (p. 435), ***L. insignis*** (p. 433), ***L. locardi*** ? (p. 434) ; †MAZZETTI (108). †***L. locardi***, Sardinia ; COTTEAU (26) p. 39. ***L. perplexa*** (p. 434), ***L. subelliptica*** (p. 434), ***L. subglobosa*** (p. 433) ; †MAZZETTI (108).

Lovenia elongata ; SLUITER (151) p. 73 : young ; KOEHLER (77) p. 416. ***L. subcarinata*** ; SLUITER (151) p. 74. †***L. tuberculata***, see ***Hemipatagus***.

†***Macropneustes*** :—***M. australis***, invalid ; TATE (157) p. 124. †***M. cordatus*** probably a ***Holaster*** ; *op. cit.* p. 123. †***M. meneghini*** ; MAZZETTI (108) p. 429. †***M. peroni***, see ***Trachyspatangus***. †***M. spatangiformis*** ; TATE (157) p. 123.

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Maretia :—†*M. pareti* ; MAZZETTI (108) p. 428. *M. planulata* ; SLUITER (151) p. 73 : colour-characters ; KOEHLER (77) p. 416. †*M. simplex* (olim *Spatangus*), Sardinia ; COTTEAU (26) p. 52.

Mellita longifissa, *M. sexforis*, *M. stokesii*, *M. testudinata* ; SLUITER (151) p. 73.

†*Melonites* :—*M. crassus* (p. 126), *M. multipora*, refigured (p. 125) ; KEYES (70).

†*Meoma* :—*M. brevipetala* is a crushed *Pericosmus compressus* ; *M. crawfordi*, syn. of *Pericosmus compressus* ; *M. tuberculata* ; TATE (157) p. 125.

Mespilia globulus ; SLUITER (151) p. 70.

Metalia maculosa, *M. sternalis* ; SLUITER (151) p. 74.

†*Metaporinus convexus*, Tithonian, Italy ; CORTI (24) p. 386.

†*Micraster*, defined and discussed (p. 156); pre-Kleinian descriptions discussed (p. 248) ; *M. aichensis*, perhaps young of *M. peini* (p. 247) ; *M. anceps* [not a n. sp. as one would suppose, but] a new var. of *M. decipiens* (p. 245); *M. antiquus*, probably not Cenomanian, and a close ally of *M. aturicus* (p. 227) ; *M. arenatus*, Sism. *non* Agassiz, maintained (p. 181); *M. arnaudi* [not a n. sp. as one would suppose, but] a new var. of *M. turonensis* (p. 244) ; *M. aturicus*, Seunes ex Hébert, probably syn. of *M. antiquus* (p. 230) ; *M. beonensis*, discussed (p. 225) ; *M. borchardi* (p. 212) ; *M. breviporus*, really due to Hébert, 1866, not Agassiz, 1840 (p. 178), defined and discussed with its varieties, which include *M. normanniæ* (p. 204) ; *M. brevis*, Desor, fully discussed, = *Spatangus gibbus*, Goldf. (p. 182) : LAMBERT (83). *M. brevisulcatus*, figured ; MAZZETTI (108) p. 426. *M. brongniarti*, defined and discussed, with vars. *pseudoglyphus*, *marginalis*, *sismondæ* (p. 199) ; *M. bucaillei*, probably var. of *M. coranguinum* (p. 234) ; *M. cayeuxi*, discussed (p. 232) ; *M. coranguinum*, fully discussed (p. 163) ; *M. corbovis*, discussed (p. 194) ; *M. corcolumbarium*, maintained and discussed (p. 202) ; *M. cordatus*, Agassiz, rejected *in toto* (p. 179) ; *M. cortestudinarium*, defined and discussed (p. 174) ; *M. cotteaui* (p. 247); *M. decipiens*, maintained and discussed (p. 217); *M. fastigatus*, probably syn. of *M. gibbus* (p. 227) ; *M. gauthieri*, discussed (p. 232) ; *M. gibbus*, defined and fully discussed, with synonymy (p. 168) ; *M. gleizexi* (p. 198) ; *M. glyphus*, discussed and compared with *M. schlœnbachi* (p. 209) ; *M. gosseleti*, discussed (p. 229); *M. gourdoni*, discussed (p. 229); *M. grossouvrei* [not a n. sp. as one would suppose, but] a new var. of *M. coranguinum* (p. 245) ; *M. heberti* (p. 212) ; *M. heinzi* (p. 247) ; *M. idæ* (p. 211) ; *M. incisus*, rejected (p. 247) ; *M. integer*, referred to *Cyclaster*, and distinguished from "*Isopneustes integer*" of Seunes (p. 198) ; *M. intermedius*, a mutation of *M. turonensis* (p. 222) ; *M. larteti*, Munier Chalmas MS., Senonian S.E. of Vitoria, Spain, described, but considered as var. of *M. corbaricus* (p. 242) ; *M. latiporus*, discussed (p. 208) ; *M. latus*, Sism. *non* Agassiz, maintained (p. 181) ; *M. laxoporus*, defined and discussed, with vars. *campaniensis* et *duranica* (p. 195); *M. leskei*, discussed (p. 178) ;

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M. lorioli, maintained (p. 234); *M. marginalis*, discussed (p. 228); *M. matheroni*, Desor, discussed and defined, includes *Epiaster michaleti*, Coquand (p. 188); *M. michelini*, defined and discussed (p. 192); *M. normanniæ*, probably var. of *M. breviporus* (p. 221); *M. peini*, discussed (p. 247); *M. regularis*, discussed (p. 224); *M. renati*, Gauthier, olim *Epiaster*, discussed (p. 226); *M. rostratus*, defined and discussed (p. 173); *M. sanctæ-maurœ* (p. 225); *M. sublacunosus* (p. 211); *M. tercensis*, defined and discussed (p. 203); *M. tropidotus*, discussed (p. 191); *M. turonensis*, maintained and fully discussed, with varying details figured (p. 212): LAMBERT (83).

M. carentonensis, Senonian of Charentes and elsewhere, hitherto referred to *M. laxoporus* (p. 240); *M. corbaricus*, Lower Senonian, Pyrenees and elsewhere, hitherto confused with *M. brevis* (p. 237); *M. icaunensis*, Lower Senonian, l'Yonne, l'Aube, la Marne, et l'Aisne, hitherto considered a var. of *M. decipiens* (p. 235); *M. provincialis*, Mornasien (= Santonien inférieur) de Ceyreste, près-la Ciotat (Bouches-du-Rhône), (p. 219, NO FIGURE); *M. senonensis*, Lower Senonian of l'Yonne and elsewhere, hitherto confused with *M. gibbus* (p. 239): LAMBERT (83), n. spp.

†*Monostychia australis*, see *Arachnoides conica*.

Neolampas rostellata; KOEHLER (79) p. 230.

†*Nucleolites*:—*N. papillosus*; TATE (157) p. 123. *N. pyramidalis*; MAZZETTI (108) p. 437.

†*Offaster pomeli*, Mun. Chalm., maintained; LAMBERT (83) p. 265.

†*Oligoporus*:—*O. danæ*, refigured (p. 126), *O. parvus* (p. 127); KEYES (70).

O. mutatus, Keokuk Limestone, Keokuk, Ia.; KEYES (70), Bull. Geol. Surv. Missouri, v, p. 126, n. sp.

†*Opissaster*:—*O. bleicheri*, referred to *Schizaster*; COTTEAU & GAUTHIER (27) p. 45.

O. centrosus, Senonian of Derre-i-Chahr, Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 45. *O. lovisatoi*, Miocene, "Calcaire argileux du Mt. S. Michele," "Marnes près de la Cantoniera de Cadreas," Sardinia; COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13, p. 48. *O. mariæ* [ascribed to "Lovisato, 1893," but apparently n. sp.], Miocene, "Calcaire compact (tramezzario) des environs de Cagliari," Sardinia; *op. cit.* p. 49. *O. morgani*, Senonian of Awasa, Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 43: n. spp.

†*Ornithaster*, rediagnosed; *O. douvillei*, Senonian, "Couches a grand Cérites" of Derre-i-Chahr, Louristan; *op. cit.* p. 48, n. sp.

†*Orthechinus cretaceus*, Senonian of Derre-i-Chahr, Louristan; *op. cit.* p. 100, n. sp.

†*Orthopsis*:—*O. globosa*, Aftab, Derre-i-Chahr, and Kouh-Mapeul (p. 89), *O. morgani*, Derre-i-Chahr (p. 87), Senonian of Louristan; *op. cit.* n. spp.

Palæostoma mirabilis; SLUITER (151) p. 74.

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Palæotropus hirondellei, S.W. of Pico, Azores, 927 metres; KOEHLER (78) Bull. Soc. zool. France, xx, p. 226; Azores, 523–1385 metres, G. of Gascony, 1262 metres; KOEHLER (79) p. 230, n. sp.

Palechinoidea, general discussion relative to *Bothriocidaris*; JAEKEL (66).

†*Parapygus*:—*P. acutus*, Derre-i-Chahr (p. 59), *P. inflatus*, Endjir-kouh in Aftab (p. 55), *P. petalodes*, Aftab (p. 58), *P. vaslini*, Derre-i-Chahr (p. 56), Senonian of Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse: n. spp.

Parasalenia gratiosa; SLUITER (151) p. 69.

†*Pericosmus*:—*P. æqualis* (p. 428), *P. affinis* (p. 429), *P. callosus* (p. 428); MAZZETTI (108). *P. compressus*, see *Meoma crawfordi* and *M. brevipetala*. *P. dilatatus*, *P. edwardsi*; MAZZETTI (108) p. 429. *P. latus*; *op. cit.* p. 428: Sardinia; COTTEAU (26) p. 40. *P. lyoni*, see *Schizaster*. *P. malatinus*; MAZZETTI (108) p. 429. *P. orbignyi*, Sardinia; COTTEAU (26) p. 40.

Peripatagus, n. g., with type *P. cinctus*, Azores, W. of São Jorge; KOEHLER (79) p. 231, n. sp.

Peronella decagonalis; KOEHLER (77) p. 417; SLUITER (151) p. 72.

Phormosomum luculentum; KOEHLER (78) p. 224 & (79) p. 228.

Phyllacanthus annulifera; KOEHLER (77) p. 408. *P. baculosa* (p. 68), *P. gigantea* (p. 68), *P. imperialis*, individual variations, includes *P. dubia*, Br. (p. 67), *P. verticillata* (p. 68); SLUITER (151).

Phyllobrissus, cf. *P. gresslyi*; MAAS (94) p. 273.

†*Pliolampas*:—*P. colombi*, see *Pygorhynchus*. *P. vassali* (olim *Echinanthus corsicus*, *Breynella vassali*), Sardinia; COTTEAU (26) p. 38.

P. subcarinatus, Miocene of S. Catterina de Pitinuri, Sardinia; COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13, p. 38, n. sp.

†*Plistophyma* rediagnosed (p. 104), with *P. asiaticum*, Senonian of Derre-i-Chahr, Louristan (p. 105); COTTEAU & GAUTHIER (27) Ech. foss. Perse, n. sp.

†*Proraster*, includes *Spatangus lacunosus*, Goldf., and *Schizaster antiquus*, Cott., q.v.

Psammechinus:—†*P. biaritzensis*; GREGORIO (47) p. 14. *P. miliaris*; KOEHLER (79) p. 229. †*P. monilis*?; MAZZETTI (108) p. 418. †*P. woodsi*, see *Echinus enysi*.

†*P. calarensis*, Miocene of S. Catterina de Pitinuri and C. St. Elia, Sardinia, adult and young (p. 11); †*P. sardiniensis*, associated with *P. calarensis* (p. 12); COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13: n. spp.

†*Pseudananchys* rediagnosed (p. 5), *P. persica* (p. 6), and *P. inæquifissa* (p. 7), Cenomanian of Kebir-kouh, Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse: n. spp.

†*Pseudholaster*, Pomel em. Gauthier, maintained by Gauthier in footnote; COTTEAU & GAUTHIER (27) p. 21. See also *Holaster morgani*.

Pseudoboletia indiana; SLUITER (151) p. 70.

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†*Pseudocatopygus*, n. g. of *Cassidulidæ* (p. 62), with type *P. declivis* (p. 63), also *P. longior* (p. 64), both from Senonian of Aftab, Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse : n. spp.

†*Pseudodiadema inæquale*, described and figured, Callovian of Carreaux and Basse-Sussaye (Orne); BIZET (13) p. 115.

†*Pygorhynchus* :—*P. colombi*; MAZZETTI (108) p. 437; is not a *Pliolampas*; COTTEAU (26) p. 38. *P. vassali*, Wright, "Gregory (1891) a démontré qu'elle ne pouvait rester dans ce dernier genre et a cru devoir la placer parmi ses *Breynella* . . . mais Pomel, en 1888, avait créé le genre *Pliolampas* (Paléont. de l'Algérie, Zooph. Echin. 2ᵉ livr. p. 123, sous le nom générique de *Plesiolampas* (*non* Duncan) 1887)." [The Recorder and Dr. Gregory are unable to discover the meaning of this or the rights of Mr. Pomel, since repeated applications over eight years have failed to get a single copy of the work in question]; COTTEAU (26).

†*Pygurostoma*, n. g. of *Cassidulidæ*, with type *P. morgani*, Senonian of Aftab, Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 52, n. sp.

Pygurus depressus, described and figured, Upper Callovian of Carreaux (Orne); BIZET (13).

†*Pyrina orientalis*, Senonian of Derre-i-Chahr and Endjir-kouh, Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 68, n. sp.

Rhabdobrissus perrieri, 640–840 metres, coast of Sahara; BERNARD (10) Bull. Mus. Paris, 1895, p. 209, NO FIGURE, n. sp.

†*Rhabdocidaris* :—*R. guttata*, described and figured, Upper Callovian of Carreaux (Orne); BIZET (13) p. 114. See also *Cidaris*.

†*R. compressa* [ascribed to "Cotteau, 1893," but apparently n. sp.] based on a single plate and a fragment of spine from Miocene of Capo Sant' Elia, Sardinia; COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13, p. 10, n. sp.

Rotula augusti, *R. rumphii*; SLUITER (151) p. 73.

Salenia hastigera, small individuals; KOEHLER (78) p. 224 & (79) p. 228.

†*S. cossiæa*, Senonian of Derre-i-Chahr, Endjir-kouh, and Aftab, Louristan; COTTEAU & GAUTHIER (27) Ech. foss. Perse, p. 83, n. sp.

†*Salenidia heberti*, discussed; LAMBERT (83) p. 262.

Sulmacis bicolor, *S. dussumieri*; SLUITER (151) p. 70. *S. rarispina*; KOEHLER (77) p. 413 : individual variations; SLUITER (151) p. 70. *S. sulcata*; *l. c.*

Schizaster :—†*S. ambulacrum*; MAZZETTI (108) p. 431. †*S. antiquus*, Cott., referred to *Proraster*; LAMBERT (83) p. 177. *S. archiaci* (p. 433), *S.* aff. *archiaci*, var. *lata* (p. 430), *S. baylei* (p. 432), *S. beloutchistanensis* ? (p. 432); †MAZZETTI (108). †*S. bleicheri*, removed from *Opissaster*; COTTEAU & GAUTHIER (27) p. 45. *S. canaliferus* (p. 431), *S. convexus* (p. 430), *S. cristagalli* (p. 433), *S. desori* (p. 432); †MAZZETTI (108). †*S. desori* ?, Sardinia; COTTEAU (26) p. 44. †*S. d'urbani*, includes *S. canaliferus*, MAZZ. (p. 431), †*S. exagonalis* [sic] (p. 430); MAZZETTI (108). †*S. exoletus*, possibly syn. of *S. abductus*;

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TATE (157) p. 126. †*S. foveatus*; MAZZETTI (108) p. 432. *S. fragilis*; GRIEG (49) p. 11; SLUITER (151) p. 74. †*S. globulus*; GREGORIO (47) p. 16; MAZZETTI (108) p. 432. †*S. laubei* (p. 430), †*S. lorioli* (p. 432); *op. cit.* †*S. lyoni*, probably a *Pericosmus*; TATE (157) p. 125. *S. moseleyi*; BERNARD (12). †*S. oviformis*; MAZZETTI (108) p. 430. †*S. parkinsoni*; *op. cit.* p. 432: large individual described from Sardinia; COTTEAU (26) p. 43. †*S. peroni*, important variations from type, Sardinia; *op. cit.* p. 42. *S. philippii*; BERNARD (12). *S. princeps* (p. 432), *S. pumilius* (p. 433), *S. rimosus* (p. 431); †MAZZETTI (108). †*S. rotundatus*; TATE (157) p. 126. †*S. rotundus*; MAZZETTI (108) p. 430. *S. scillæ*; MAZZETTI (108) p. 431: Sardinia, includes the "*S. eurynotus*, Ag., *S. ambulacrum*, Desh., and *S. græcus*, Ag.," recorded by De la Marmora from Sardinia; COTTEAU (26) p. 42. *S. studeri* (p. 433), *S. trigonalis* (p. 429), *S. vicinalis* (p. 431); †MAZZETTI (108).

†*S. lovisatoi*, Miocene, "couche langhienne a *Vaginella depressa*," Castelsardo in Sassari, Sardinia (p. 45); †*S. sardiniensis*, Miocene, "Calcaire argileux de Cucuruddu sous Chemerule (Thiesi)," Sardinia (p. 46): COTTEAU (26) Mem. Soc. geol. France, Pal. v, fasc. ii, Mém. No. 13: n. spp.

†*Scutella propinqua*, Sardinia; *op. cit.* p. 15. †*S. subrotunda*, with var. *maxima*, Michelin, and another variation, from Miocene of Sardinia; *l. c.*

†*Scutellaster*, n. g., with type *S. cretaceus*, Fox Hills group, Shook's Run, Platt Avenue, Colorado Springs, Col., has affinities with both *Clypeaster* and *Scutella*; CRAGIN (29) Amer. Geol. xv, p. 90, n. sp.

Spatangus sp.; KOEHLER (79) p. 230. *S. æquedilatatus* (p. 422), *S. arcuatus* (p. 418), *S. austriacus* (p. 423), *S. brissoides*, figured (p. 423), *S. chitonosus* (p. 421), *S. cor*, possibly syn. of *S. philippii* (p. 423); †MAZZETTI (108). †*S. cormarinum*, var. of *Micraster coranguinum*, discussed; LAMBERT (83) pp. 165 & 167. †*S. corsicus*; MAZZETTI (108) p. 419: distinct from *S. delphinus*, variations in tubercles, Sardinia; COTTEAU (26) p. 52. †*S. cuneatus* is young of *Micraster coranguinum*; DEECKE (31) p. 72. †*S. delphinus*; COTTEAU (26) p. 52; MAZZETTI (108) p. 418. †*S. desmaresti*; *l. c.* †*S. discoidalis*; *op. cit.* p. 422. †*S. gibbus*, Goldf., *non* Lamk., discussed, referred to *Micraster brevis*, Desor; LAMBERT (83) pp. 176 & 182. †*S. granulosus* is *Cardiaster ananchytis*; DEECKE (31) p. 72. †*S. hemiornatus*; MAZZETTI (108) p. 424. †*S. hemisphæricus*; *op. cit.* p. 420. †*S. lacunosus*, Goldf., *non* Linn. *nec* Leske, referred to *Proraster*; LAMBERT (83) p. 176. *S. lütkeni*; SLUITER (151) p. 73. *S. mutinensis* (p. 424), *S. ocellatus* (p. 422), *S. pagliarolensis* (p. 421); †MAZZETTI (108). †*S. peroni*, Sardinia; COTTEAU (26) p. 53. †*S. philippii*; MAZZETTI (108) p. 420. †*S. podex*; *op. cit.* p. 422. †*S. punctatus*, probably var. of *Micraster coranguinum*; LAMBERT (83) p. 167. *S. purpureus*; GRIEG (49) p. 11; MARENZELLER (104) p. 143; SLUITER (151) p. 73. †*S. purpureus*, Leske; MAZZETTI (108) p. 425. †*S.*

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purpureus (Müll. ?) Agass., figured; MAZZETTI (108) p. 424. *S. raschii*; GRIEG (49) p. 11. *S. regina* (p. 420), *S. rissoi* (p. 424), *S. semelanensis* (p. 423); †MAZZETTI (108). †*S. simplex*, see *Maretia*. †*S. spinosissimus*, probably includes *S. purpureus*, *S. siculus*, and *S. meridionalis*, figured; MAZZETTI (108) p. 419. †*S. subconicus*; *op. cit.* p. 420.

Sphærechinus australiæ; SLUITER (151) p. 70. *S. granularis*; SEELIGER (148); SLUITER (151) p. 70: spermatogenesis; FIELD (38): small specimen; KOEHLER (78) p. 225: karyokinesis of ovum; HILL (58): fecundation of ovum; HILL (59): genital system and madreporite; RUSSO (141).

Stephanocidaris bispinosa; KOEHLER (77) p. 409.

Stomopneustes variolaris; SLUITER (151) p. 69.

Strongylocentrotus albus; BERNARD (12). *S. depressus*; SLUITER (151) p. 69. *S. dröbachiensis*; GRIEG (49) p. 11; KOEHLER (78) p. 225; SLUITER (151) p. 69. *S. eurythrogrammus*; *l. c.* *S. franciscanus*; *l. c.* *S. intermedius*; *l. c.* *S. lividus*; KOEHLER (78) p. 225 & (79) p. 229; SLUITER (151) p. 70; ZOJA (181): spermatogenesis; FIELD (38): experimental change of environment during development and its effect; VERNON (163). *S. mexicanus*; SLUITER (151) p. 70. *S. tuberculatus*; *l. c.* See also *Toxopneustes*.

Temnechinus scillæ, described and figured; MAZZETTI (107) p. 213.

Temnopleurus hardwickii, *T. reynaudi*, *T. toreumaticus*; SLUITER (151) p. 70.

Toxobrissus, see *Kleinia*.

Toxopneustes, ovum; WILSON (173). *T. pileolus*; KOEHLER (77) p. 414; SLUITER (151) p. 71. *T. variegatus*; *l. c.*; WILSON (172); WILSON & MATHEWS (175). See also *Strongylocentrotus*.

†*Trachyspatangus peroni* (olim *Macropneustes*), Sardinia; COTTEAU (26) p. 51.

Trigonocidaris albida; KOEHLER (78) p. 224 & (79) p. 228.

†*Tripneustes parkinsoni*; MAZZETTI (108) p. 418.

Tripylus excavatus, syn. of *T. cavernosus*; BERNARD (12): with commensal Lamellibranch; BERNARD (11).

†*Trisalenia*, n. g., with type *Salenia loveni*, Cotteau; LAMBERT (83) p. 262.

†*Tylocidaris clavigera*, discussed; LAMBERT (83) p. 261.

†*Vologesia*, n. g. of *Cassidulidæ* (p. 65), with type *V. tataosi*, Senonian of Aftab, Louristan (p. 66), COTTEAU & GAUTHIER (27) Ech. foss. Perse, n. sp.

(D.)—ASTEROIDEA.

General account and classification of fossil forms under Orders: *Encrinasteriæ* and *Euasteriæ*, the latter divided with Sladen into *Phanerozonia* and *Cryptozonia*; ZITTEL (180) p. 170.

Achanthaster echinites; KOEHLER (77) p. 402; SLUITER (150) p. 63.

Anasterias minuta, see *Asterias rugispina*.

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Anthenea flavescens, *A. pentagonula*; SLUITER (150) p. 55.

Archaster parelii, see *Pseudarchaster intermedius*. *A. tenuispinus*, see *Pontaster hebitus*. *A. typicus*; KOEHLER (77) p. 386: hardly to be distinguished from *A. angulatus*; SLUITER (150) p. 52.

Asteracanthion rubens, specimens from Hohwachter Bucht, Baltic, measured; REH (137) p. 243.

Asterias briareus, distribution; VERRILL (164) p. 209. *A.* (*Stolasterias*) *calamaria*, difference of colour with depth, a variety with clavate and clustered spines; FARQUHAR (37) p. 200. *A. forbesi*; SLUITER (150) p. 64; WILSON & MATHEWS (175): spermatogenesis; FIELD (38): distribution; VERRILL (164) p. 206. *A. gelatinosa*, *A. gemmifera*; SLUITER (150) p. 64. *A. glacialis*; GRIEG (49) p. 8; SLUITER (150) p. 64: spermatogenesis; FIELD (38), see also *Brachiolaria*. *A. groenlandica*, *A. gunneri*, *A. linckii*; SLUITER (150) p. 64. *A. mülleri*; *l. c.*; GRIEG (49) p. 8. *A. panopla*; SLUITER (150) p. 64. *A. polaris*; *l. c.*; includes *A. borealis*; VERRILL (164) p. 208. *A. richardi*, autotomy due to *Myzostoma*, this species not a *Hydrasterias*; MARENZELLER (103) & (104) p. 134. *A. rubens*; GRIEG (49) p. 8; SLUITER (150) p. 64: deep water large, shallow small, due to variation or age?; HERDMAN (55) p. 35. *A. rugispina*, full description of external characters, includes *A. spirabilis*, *A. cunninghami*, *A. perrieri*, *A. rupicola*, *A. hyndesi*, *Anasterias minuta*, and probably *Asterias antarctica*, *A. fulgens*, *A. verrilli*, *Calvasterias antipodum*, and *C. stolidota*; LEIPOLDT (84) p. 563. *A.* (*Stolasterias*) *scabra*, external characters described, pedicellariæ figured; FARQUHAR (37) p. 202. *A. stellionura*; SLUITER (150) p. 64: distribution; VERRILL (164) p. 207. *A.* (*Cosmasterias*) *sulcifera*, full description of external characters, includes *A. fulva* and *Stichaster polygrammus*; LEIPOLDT (84) p. 553. *A. tanneri*, distribution; VERRILL (164) p. 209; *A. tenera*; SLUITER (150) p. 64. *A.* (*Cosmasterias*) *tomidata*, young described, and adult variations from type; LEIPOLDT (84) p. 552. *A. vulgaris*, includes *A. stimpsoni* pars, *A. pallidus*, and *A. fabricii*, distribution; VERRILL (164) p. 207.

A. austera, 33–35 fms., George's Bank and off C. Cod, perhaps a *Leptasterias*; VERRILL (164) Amer. J. Sci. xlix, p. 209. *A. enopla*, 53–100 fms., off Nova Scotia; *op. cit.* p. 208: n. spp.

Asterina calcar, *A. cephea*; SLUITER (150) p. 59. *A. chilensis*, full description and figures of external characters, possibly includes *A. gayi*; LEIPOLDT (84) p. 595. *A. coronata*; SLUITER (150) p. 60. *A. exigua*; *op. cit.* p. 59; KOEHLER (77) p. 388. *A. fimbriata*, 6-armed and young specimens, variations from type; LEIPOLDT (84) p. 594. *A. gibbosa*, development; RUSSO (142): Arctic Ocean and Greenland; SLUITER (150) p. 59. *A. marginata*; *l. c.* *A. pectinifera*; *op. cit.* p. 60. *A. pygmæa*, distribution; VERRILL (164) p. 140. *A. regularis*; SLUITER (150) p. 59: 6-rayed specimens, one with 2 madreporites; FARQUHAR (37) p. 199. *A. stellifer*, from Magellan Str.; LEIPOLDT (84) p. 592.

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Astrella simplex, see *Luidia sarsi*; LUDWIG (92).

Astrogonium propegeometricum, vide *Petalastrum*. *A. pulchellum*, variety with apical plates but slightly swollen, and with well-developed supplementary plates; FARQUHAR (37) p. 200.

Astropecten acanthifer, Red Sea; LEIPOLDT (84) p. 644. *A. alatus*; SLUITER (150) p. 53. *A. americanus* and *A. articulatus*, distribution; VERRILL (164) p. 133. *A. aurantiacus*; SLUITER (150) p. 53. *A. irregularis*; *l. c.*; GRIEG (49) p. 5. *A. javanicus*; SLUITER (150) p. 53. *A. pentacanthus*, spermatogenesis; FIELD (38). *A. polyacanthus*; KOEHLER (77) p. 387; LEIPOLDT (84) p. 645; SLUITER (150) p. 53. *A. vestitus*, distribution; VERRILL (164) p. 133.

A. ornans, New Ireland and New Caledonia; SLUITER (150) Bijdr. Dierk. xvii, p. 54. *A. orsinii*, Perim Id., Red Sea, sandy bottom, allied to *A. tamilicus* and *A. zebra*; LEIPOLDT (84) Zeitschr. wiss. Zool. lix, p. 645. *A. ternatensus* [sic], Moluccas; SLUITER (150) Bijdr. Dierk. xvii, p. 53 : n. spp.

Bathybiaster robustus, distribution; VERRILL (164) p. 134.

Benthopecten spinosus, includes *Pararchaster armatus* and *P. semisquamatus*, var. *occidentalis* of Sladen, distribution; *op. cit.* p. 129.

"*Bipinnaria asterigera*" (? of *Luidia*), development; BURY (17) pp. 65–71. Vide *Luidia sarsi*.

"*Brachiolaria*" (? of *Asterias glacialis*), development; BURY (17) pp. 71–74.

Brisinga coronata, distribution in Mediterranean; MARENZELLER (104) p. 137. *B. costata*, distribution; VERRILL (164) p. 211. *B. mediterranea*, Perrier, syn. of *B. coronata*; MARENZELLER (100). *B. multicostata* (p. 211), and *B. verticillata* (p. 212), distribution; VERRILL (164).

Calvasterias antipodum and *C. stolidota*, see *Asterias rugispina*.

Chætaster longipes, spermatogenesis; FIELD (38).

Chondraster, n. g. or subg. for reception of *Porania grandis* pars; VERRILL (164), Amer. J. Sci. xlix, p. 137.

Cosmasterias, see *Asterias*.

Craspidaster hesperus; SLUITER (150) p. 52.

Cribrella hyadesi, external characters described, probably includes *C. obesa*, and perhaps other species from Antarctic Seas; LEIPOLDT (84) p. 578. *C. oculata*; SLUITER (150) p. 63. *C. pagenstecheri*, probably young of some species; LEIPOLDT (84) p. 579. *C. pectinata*, distribution; VERRILL (164) p. 204. *C. sanguinolenta* (= *C. oculata*), distribution; *op. cit.* p. 205. *C. simplex*, probably young of some species; LEIPOLDT (84) p. 579.

Crossaster affinis, specimens with 9 and 11 arms; SLUITER (150) p. 61. *C. helianthus*, distribution; VERRILL (164) p. 201. *C. papposus*; SLUITER (150) p. 61: spermatozoon; BALLOWITZ (3) : distribution; VERRILL (164) p. 201.

Ctenodiscus corniculatus; SLUITER (150) p. 52. *C. crispatus* (= *C. corniculatus*), distribution; VERRILL (164) p. 132.

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Cycethra electilis, external characters described ; LEIPOLDT (84) p. 606. *C. nitida*, external characters described, variation from type ; *op. cit.* p. 602.

Culcita coriacea ; SLUITER (150) p. 57 : external characters, esp. *papulæ*, described ; LEIPOLDT (84) pp. 639 & 651. *C. novæ-guineæ*, redescribed and distinguished from *C. pentangularis*, *C. grex*, *C. plana*, and (?) *C. arenosa*, with discussion of specific characters in the genus; KOEHLER (77) p. 388 : specific characters discussed, change of form during life, probably includes *C. schmideliana*; SLUITER (150) p. 57. *C. plana*, variations from type ; LEIPOLDT (84) p. 637.

C. niassensis, Nias Id., W. of Sumatra ; SLUITER (150) Bijdr. Dierk. xvii, p. 58, n. sp.

Diplopteraster multipes, distribution ; VERRILL (164) p. 202.

Dytaster grandis, includes *D. madreporifer*, and perhaps *D. exilis*, var. *carinata* of Sladen, distribution ; VERRILL (164) p. 131.

Echinaster eridanella, *E. purpureus* ; SLUITER (150) p. 64. *E. sepositus*, *l. c.* : spermatogenesis ; FIELD (38). *E. spinosus*, Japan ; SLUITER (150) p. 63.

E. callosus, Solomon Is. ; MARENZELLER (101) Anz. Ak. Wiss. 1895, No. xviii, p. 191 ; also MARENZELLER (105). *E. panamensis*, Perlas Archipelago, G. of Panama, resembles *Othilia aculeata* and *Mithrodia victoriæ* ; LEIPOLDT (84) Zeitschr. wiss. Zool. lix, p. 584 : n. spp.

Freyella aspera, *F. elegans*, and *F. microspina*, distribution ; VERRILL (164) p. 212.

Fromia milleporella ; SLUITER (150) p. 60.

F. major, Sunda Is. ; KOEHLER (77) p. 399, n. sp.

Gnathaster pilulatus, see *Odontaster meridionalis*.

Goniodiscus articulatus ; KOEHLER (77) p. 392. *G. sebæ* ; SLUITER (150) p. 55.

Gymnasterias carinifera ; SLUITER (150) p. 59 : pedicellariæ and spicules described ; LEIPOLDT (84) p. 649.

Heliaster cumingii, number of arms, character of spines and of pedicellariæ ; LEIPOLDT (84) p. 550. *H. helianthus* ; SLUITER (150) p. 64 : pedicellariæ described ; LEIPOLDT (84) p. 547. *H. microbrachius*, pedicellariæ described ; *op. cit.* p. 552. *H. multiradiatus*, colour and pedicellariæ described ; *op. cit.* p. 551.

Henricia sanguinolenta ; GRIEG (49) p. 8.

Hippasteria phrygiana ; *op. cit.* p. 6 : (= *H. plana*) distribution ; VERRILL (164) p. 137. *H. plana* ; SLUITER (150) p. 55.

Hydrasterias ophidion, distribution ; VERRILL (164) p. 211.

Hymenaster modestus, distribution ; *op. cit.* p. 203. *H. pellucidus* ; SLUITER (150) p. 63.

H. regalis, 1374 fms., 36° 34′ N., 73° 48′ W. ; VERRILL (164) Amer. J. Sci. xlix, p. 203, n. sp.

Iconaster longimanus ; KOEHLER (77) p. 393.

Isaster bairdii, distribution ; VERRILL (164) p. 136.

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Lasiaster, probably young of *Porania* or *Poraniomorpha*; *op. cit.* p. 139.

Leiaster leachii; SLUITER (150) p. 60.

Leptasterias compta (p. 209), and *L. groenlandica* (p. 210), distribution; VERRILL (164) p. 210. *L. littoralis*, breeding season, distribution; *op. cit.* p. 211. *L. tenera*, perhaps = *L. compta* and *L. mülleri*, distribution; *op. cit.* p. 210. See also *Asterias*.

L. hispidella, 50 fms., station 2494 of U. S. Fish Comm., 45° 14′ 30″ N.; VERRILL (164) Amer. J. Sci. xlix, p. 210, n. sp.

Leptoptychaster arcticus; SLUITER (150) p. 53: distribution; VERRILL (164) p. 133.

Linckia ehrenbergii; LEIPOLDT (84) p. 649; SLUITER (150) p. 60. *L. guildingii*; *l. c.* *L. miliaris*; LEIPOLDT (84) pp. 634 & 648; SLUITER (150) p. 60. *L. multifora*; *l. c.*: anatomy of comet-form; HIROTA (60). *L. pacifica*; SLUITER (150) p. 60.

Lophaster furcifer; SLUITER (150) p. 63: distribution; VERRILL (164) p. 201.

Lophopteraster, n. g., with type *L. abyssorum*, 2021 fms., 37° N., 71° 54′ W.; VERRILL (164) Amer. J. Sci. xlix, pp. 202 & 203, n. sp.

Luidia ciliaris, of Mediterranean, described and distinguished from *L. sarsi*; KOEHLER (75) p. 317: synonymy and full description of external characters; LUDWIG (92) p. 18. *L. clathrata*, distribution: VERRILL (164) p. 134. *L. columbiæ*; SLUITER (150) p. 54: variations in paxillæ; LEIPOLDT (84) p. 609. *L. elegans*, distribution; VERRILL (164) p. 134. *L. hardwickii*; SLUITER (150) p. 55. *L. maculata*; KOEHLER (77) p. 387; SLUITER (150) p. 55. *L. paucispina*, Marenzeller, referred with Ludwig to *L. sarsii*, as being young form, growth-stages discussed; MARENZELLER (104) p. 132. *L. sarsii*; GRIEG (49) p. 6: of Mediterranean, described and distinguished from *L. ciliaris*; KOEHLER (75) p. 320: synonymy, including *Astrella simplex*, external characters described, its larva is *Bipinnaria asterigera* (q.v.); LUDWIG (92) p. 19.

L. magellanica, Magellan Str., allied to *L. bellonæ*; LEIPOLDT (84) Zeitschr. wiss. Zool. lix, p. 610, n. sp.

Marginaster, probably young of *Porania* or *Poraniomorpha*; VERRILL (164) p. 139. *M. capreensis*; MARENZELLER (104) p. 133.

Mithrodia clavigera; SLUITER (150) p. 63. *M. victoriæ*, see *Echinaster panamensis*.

Nardoa novæ-caledoniæ; SLUITER (150) p. 60. *N. pauciforis*, variations from type, parasitic *Stitifer linckiæ*; *op. cit.* p. 61. *N. semiregularis*, *N. tuberculata*, and *N. variolata*; *l. c.*

Nectria ocellifera, from Amboyna, the species includes *N. ocellata*, Perrier; SLUITER (150) p. 55.

Neomorphaster forcipatus, distribution; VERRILL (164) p. 206.

Nidorellia armata, variations in spines and pedicellariæ, includes *N. michelini*; LEIPOLDT (84) p. 634. *N. michelini*; SLUITER (150) p. 57.

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Nymphaster florifer and *N. nora*; ALCOCK (1).

Odinia americana, distribution; VERRILL (164) p. 211.

Odontaster sp. juv., $r = 2$ mm., external characters fully described; LEIPOLDT (84) p. 630. *O. hispidus*, distribution; VERRILL (164) p. 136. *O. mediterraneus*, redescribed and figured, olim *Gnathaster*, compared with *O. hispidus*; MARENZELLER (104) p. 129. *O. meridionalis*, external characters fully described and figured, probably includes *O. grayi*, *O. pedicellaris*, and *Gnathaster pilulatus*; LEIPOLDT (84) p. 620. *O. singularis*, variations in adambulacral spines, pedicellariæ first described, one specimen with 6 rays but only 3 teeth, distinguished from *O. belli*; *op. cit.* p. 614.

Ogmaster capella, Red Sea; LEIPOLDT (84) p. 649.

†*Onychaster asper*, from Missouri; KEYES (70) p. 131.

Ophidiaster attenuatus, redescribed and distinguished from that so called by Perrier; MARENZELLER (104) p. 133. *O. cylindricus*; SLUITER (150) p. 60. *O. helichostichus*, var. nov. *inarmatus*, Sunda Is.; KOEHLER (77) p. 400. *O. ophidianus*, and *O. purpureus*; SLUITER (150) p. 60. *O. pusillus*, variation in pedicellariæ; *l. c.*

Oreaster alveolatus, see *Pentaceros mammillatus*.

Othilia aculeata, see *Echinaster panamensis*.

Palmipes membranaceus; SLUITER (150) p. 60.

Paragonaster formosus, perhaps includes *P. cylindratus*, distribution; VERRILL (164) p. 137.

Pararchaster armatus, and *P. semisquamatus*, var. *occidentalis*, see *Benthopecten spinosus*.

Pedicellaster typicus; GRIEG (49) p. 6: includes *P. palæocrystallus*, distribution; VERRILL (164) p. 205.

Pentaceropsis euphues, young specimen from the Moluccas; SLUITER (150) Bijdr. Dierk. xvii, p. 56, n. sp.

Pentaceros affinis, *P. grayi*, and *P. hiulcus*; SLUITER (150) p. 55. *P. lutkeni*, redescribed with slight variations from type; KOEHLER (77) p. 395. *P. mammillatus*; LEIPOLDT (84) p. 651: neanic forms fully described, *Oreaster alveolatus*, Bell, is a syn.; KOEHLER (77) p. 396. *P. muricatus*; SLUITER (150) p. 56. *P. occidentalis*, large specimen; LEIPOLDT (84) p. 634. *P. productus*, slight variation from type; SLUITER (150) p. 56. *P. reinhardti*; SLUITER (150) p. 56. *P. reticulatus*; LEIPOLDT (84) p. 634: probably includes *P. lapidarius*, Grube; SLUITER (150) p. 56. *P. sladeni*, from Moluccas; *l. c.* *P. tuberculatus*; *l. c.* *P. turritus*, *l. c.*; KOEHLER (77) p. 394.

Pentagonaster astrologorum; SLUITER (150) p. 55. *P. attenuatus* has alveolar pedicellariæ on ventrolateral plates; MARENZELLER (100). *P. eximius*, distribution; VERRILL (164) p. 134. *P. granularis*; SLUITER (150) p. 55: distribution; VERRILL (164) p. 135: 4- and 6-rayed; GRIEG (49) p. 6. *P. hispidus*; GRIEG (49) p. 6. *P. hystricis*; MARENZELLER (104) p. 133. *P. investigatoris*; ALCOCK (1). *P. placenta*; MARENZELLER (104) p. 133.

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†*P. chantrei*, Virgulien, Cirin (Ain); LORIOL (88) Arch. Mus. Lyon, vi, p. 6. *P. planus*, 156 fms., 39° 53′ N., and *P. simplex*, 640 fms., Martha's Vineyard; VERRILL (164) Amer. J. Sci. xlix, p. 135 : n. spp.

Petalastrum, n. subg. *Astrogonii*, M. T., cum typo *A. propegeometricum*, Post-pliocene, Sicily; GREGORIO (48) Ann. Geol. Pal. Livr. xvii, n. sp.

Pharia pyramidata, found at Valparaiso, a specimen with 6 rays; LEIPOLDT (84) p. 633.

Plutonaster agassizii, includes *P. rigidus* and var. *semiarmata*, Sladen, distribution; VERRILL (164) p. 131. †*P. lithographicus*, Thiollière, olim *Astropecten*, from Cirin, described and figured; LORIOL (88) p. 5. *P.* (*Tethyaster*) *parelii*; GRIEG (49) p. 5; SLUITER (150) p. 51.

Pontaster forcipatus, distribution; VERRILL (164) p. 130. *P. hebitus*, includes *Archaster tenuispinus*, Verrill, not D. & K., distribution; *l. c. P. pilosus*; ALCOCK (1). *P. sepitus*, distribution; VERRILL (164) p. 131. *P. tenuispinus*; GRIEG (49) p. 5; SLUITER (150) p. 51.

Porania antarctica; LEIPOLDT (84) p. 588. *P. grandis*, see *Chondraster* and *P. insignis*, distribution; VERRILL (164) p. 137. *P. pulvillus*; GRIEG (49) p. 6; SLUITER (150) p. 59 : with one dichotomous ray, figured; HERDMAN (55) p. 71.

P. insignis, 65–373 fms., from 41° 28′ 30″ N., to 36° 38′ 30″ N., based on *P. grandis* pars, young described; VERRILL (164) Amer. J. Sci. xlix, p. 138, n. sp.

Poraniomorpha borealis, distribution, and a large specimen described; VERRILL (164) p. 139. *P. rosea*; SLUITER (150) p. 59. *P. spinulosa*, with varr. *rudis* and *inermis*, and a large exceptional specimen, distribution; VERRILL (164) p. 139.

Poraniopsis echinasteroïdes, redescribed and figured, placed in *Poraniidæ*; LEIPOLDT (84) p. 589.

Porcellanaster cæruleus, distribution; VERRILL (164) p. 133.

Pseudarchaster concinnus, distribution (p. 132), *P. intermedius*, includes *Archaster parelii*, Verrill, *non* D. & K., distribution (p. 131), *P. intermedius*, n. var. *insignis*, 100–1356 fms., Nova Scotia to 40° 09′ 30″ N. (p. 132); VERRILL (164) Amer. J. Sci. xlix. *P. tessellatus*, n. var. *arcticus*, Barent's Sea, 150 fms.; SLUITER (150) Bijdr. Dierk. xvii, p. 51.

Psilaster andromeda; GRIEG (49) p. 6. *P. floræ*, distribution; VERRILL (164) p. 133.

Pteraster militaris; SLUITER (150) p. 63: distribution; VERRILL (164) p. 202: not purely Arctic, a 7-rayed specimen; GRIEG (49) p. 7. *P. pulvillus*; GRIEG (49) p. 8; SLUITER (150) p. 63 : distribution; VERRILL (164) p. 201.

Pycnopodia helianthoïdes; LEIPOLDT (84) p. 577.

Retaster, see *Diplopteraster*.

Rhegaster tumidus, var. *tuberculata*; SLUITER (150) p. 59.

R. abyssicola, 2045 fms., off Delaware Bay, 37° N., 71° 54′ W.; VERRILL (164) Amer. J. Sci. xlix, p. 140, n. sp.

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Solaster abyssicola and *S. benedicti*, distribution ; VERRILL (164) p. 200. *S. endeca* ; GRIEG (49) p. 6 ; SLUITER (150) p. 61 : distribution ; VERRILL (164) p. 199. *S. earllii*, distribution and variations from type described ; *op. cit.* p. 200. *S. furcifer* ; GRIEG (49) p. 6. *S. glacialis* ; SLUITER (150) p. 61. *S. papposus*, eats *Asterias rubens* and *A. glacialis* ; GRIEG (49) p. 6. *S. syrtensis*, distribution ; VERRILL (164) p. 199.

Solaster intermedius, Barent's Sea, 45 fms., intermediate between *Solaster*, *Korethraster*, *Peribolaster*, *Lophaster*, and *Crossaster* ; SLUITER (150) Bijdr. Dierk. xvii, p. 61, n. sp.

Stegnaster inflatus ; FARQUHAR (37) p. 199.

Stellaster equestris, surface-characters described ; KOEHLER (77) p. 393. *S. incei* ; SLUITER (150) p. 55. *S. squamulosus*, found at Sunda Is. ; KOEHLER (77) p. 394.

Stichaster albulus, distribution ; VERRILL (164) p. 206. *S. aurantiacus* ; SLUITER (150) p. 61 : found at Porto Lagunas, also a 4-rayed example ; LEIPOLDT (84) p. 578. *S. australis*, strength of tube-feet ; FARQUHAR (37) p. 202. *S. polygrammus*, see *Asterias* (*Cosmasterias*) *sulcifera*. *S. roseus* ; GRIEG (49) p. 6 ; SLUITER (150) p. 61.

S. insignis, from low-water mark to 12 fms., Wellington Harbour and Taylor's Mistake near Lyttelton, N. Z., full account of fission and figures of regenerating individuals (p. 203), *S. littoralis*, Taylor's Mistake near Lyttelton, and Stewart Id., N. Z., low water (p. 206) ; FARQUHAR (37) Tr. N. Zealand Inst. xxvii : n. spp.

Stolasterias, see *Asterias*. *S. neglecta*, found in E. Mediterranean, at only 160 metres, variations from type, parasitic *Myzostoma* ; MARENZELLER (100, 103, & 104).

Tarsaster neozelanicus, on *Lessonia*, Ohiro and Lyall Bays, N. Z., examples of fission figured ; FARQUHAR (37) Tr. N. Zealand Inst. xxvii, p. 207, n. sp.

Tethyaster, vide *Plutonaster*.

Temnaster hexactis, distribution ; VERRILL (164) p. 202.

Tremaster mirabilis, distribution ; VERRILL (164) p. 141.

Zoroaster carinatus ; ALCOCK (1). *Z. diomedeæ*, probably includes *Z. fulgens* and *Z. ackleyi*, distribution ; VERRILL (164) p. 205. *Z. squameus* ; ALCOCK (1).

(E).—OPHIUROIDEA.

†General account and classification of fossil forms in Orders : *Euryaleæ* and *Ophioureæ* ; ZITTEL (180) p. 166.

Amphiura bellis, var. *tritonis*, Hoyle, referred to n. g. *Paramphiura* ; KOEHLER (75) p. 333. *A. chiajei* ; GRIEG (49) p. 8 ; MARENZELLER (104) p. 139 ; 2 miles S. of Plymouth Breakwater ; SUMNER

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(156). *A. elegans*; GRIEG (49) p. 9. *A. filiformis*; GRIEG (49) p. 8; MARENZELLER (104) p. 139. *A. florifera*, in E. Mediterranean, same as *Amphilepis norvegica*, Ljungm.; MARENZELLER (100). *A. punctata*, Forbes, from Pas-de-Calais, made type of n. g. *Paramphiura*; KOEHLER (75) p. 331. *A. securigera*; GRIEG (49) p. 9.

Amphilepis florifera, Forbes, olim *Amphiura*, includes *A. norvegica*, Ljungman, refound in E. Mediterranean, and properly described and figured; MARENZELLER (104) p. 139. *A. norvegica*; GRIEG (49) p. 9; see *A. florifera*.

Euryale aspera; KOEHLER (77) p. 407.

Gorgonocephalus lamarckii, and *G. linckii*; GRIEG (49) p. 10.

Ophiacantha abyssicola; GRIEG (49) p. 10.

Ophiactis abyssicola, *O. ballii*, and *O. clavigera*; GRIEG (49) p. 9.

Ophiocoma nigra; *l. c.* *O. scolopendrina*; KOEHLER (77) p. 402.

Ophioconis forbesi; MARENZELLER (104) p. 137.

Ophiocten abyssicolum [sic] redescribed and figured; *l. c.* *O. sericeum*; GRIEG (49) p. 8.

Ophioderma longicauda, spermatogenesis; FIELD (38).

O. propinqua, Sunda Is.; KOEHLER (77) Mem. Soc. zool. France, viii, p. 404, n. sp.

Ophioglypha albida, specimens from Hohwachter Bucht, Baltic, measured; REH (137) p. 243. *O. carnea*, in Mediterranean; MARENZELLER (104) p. 137. *O. lacetosa*, spermatogenesis; FIELD (38).

Ophiohelix, n. g., with type *O. elegans*, Sunda Is., a Zygophiuroid; KOEHLER (77) Mem. Soc. Zool. France, viii, p. 405, n. sp.

Ophiomastix annulosa; *op. cit.* p. 403.

Ophiomaza cacaotica, n. var. *picta*, Sunda Is.; *op. cit.* p. 405.

Ophiomyxa australis; FARQUHAR (37) p. 199. *O. pentagona*; MARENZELLER (104) p. 142: spermatogenesis; FIELD (38).

Ophionereis schayeri, described, includes *O. fasciata*; FARQUHAR (37) p. 197.

Ophiopeza cylindrica, Hutton, not a syn. of *Pectinura rigida* as supposed by Lyman; FARQUHAR (37) p. 198.

Ophiopholis aculeata; GRIEG (49) p. 9.

Ophiopinax stellatus; KOEHLER (77) p. 404.

Ophiopsila aranea; MARENZELLER (104) p. 141.

Ophioscolex glacialis; GRIEG (49) p. 9. *O. purpurea*, breeding season, sudden appearance in Bergens fjord; *op. cit.* p. 10.

Ophiothrix alopecurus, maintained as inhabitant of Mediterranean in strongest opposition to Russo; MARENZELLER (104) p. 141. *O. cærulea*, from Fiji not New Zealand; FARQUHAR (37) p. 199. *O. echinata*, development; RUSSO (142): described, figured, and distinguished from *O. fragilis*; KOEHLER (75) p. 325. *O. fragilis*; GRIEG (49) p. 9: spermatozoon; BALLOWITZ (3): spermatogenesis; FIELD (38): described, and held to include the "forms" *abbildgardi*, *pentaphyllum*, *lusitanica*, *alopecurus*, all of which are described and figured; KOEHLER (75) p. 327. *O. longipeda*; KOEHLER (77)

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p. 407. *O. rosula*, syn. of *O. fragilis*, form *abbildgardi*; KOEHLER (75) p. 329.

Ophiura affinis, *O. albida*, *O. carnea*, *O. ciliaris*, *O. robusta*, *O. sarsii*; GRIEG (49) p. 8.

Paramphiura, n. g., with type *P. punctata* (olim *Amphiura*), and including *P. tritonis* (olim *Amphiura bellis* var. *tritonis*); KOEHLER (75) Rev. biol. Nord France, vii, p. 331.

(F.)—CRINOIDEA.

General history of classification, followed by division into Orders: *Larviformia*, *Camerata*, *Fistulata*, *Flexibilia*, *Articulata*; ZITTEL (180) p. 123.

†*Acanthocrinus*:—*A. brevispina*, probably invalid (p. 24), *A. gregarius*, maintained (pp. 24 & 26), *A. longispina*, F. A. Roemer, probably from Mid-Devon. Wissenbacher Schiefer of Oberharz (pp. 24, 26, & 111); JAEKEL (67).

A. gracilior [Lower Devonian ?] Sandstone, Coblenz (p. 27, NO FIGURE); *A. rex*, Lower Devonian Hunsrückschiefer, Caub am Rhein (p. 16); JAEKEL (67) Pal. Abh. vii : n. spp.

†*Actinocrinidæ*, evolution of family; KEYES (70) p. 148.

†*Actinocrinus*:—*A. arrosus* (p. 186), *A. brittsi* (p. 188), *A. cælatus* [sic] (p. 187); KEYES (70). *A. cyathiformis*, Stringocephalenkalk; HOLZAPFEL (61) p. 302. *A. fossatus* (p. 188), *A. glans*, refigured (p. 189), *A. jugosus* (p. 190), *A. lobatus* (p. 190), *A. lowei* (p. 189), *A. multiradiatus* (p. 188), *A. pernodosus* (p. 190), *A. proboscidialis*, refigured (p. 185), *A. reticulatus* (p. 186), *A. scitulus* (p. 188), *A. tenuisculptus* (p. 187); KEYES (70). *A. tenuistriatus*, Devonian, Elba; STEFANI (155). *A. thalia*; KEYES (70) p. 187. *A. validus*, Meek & Worthen, referred to *Steganocrinus* and maintained as species; MILLER (115) p. 41. *A. verrucosus*, refigured; KEYES (70) p. 189.

A. albersi, Chouteau Limestone, Sedalia, Mo.; MILLER (115) Bull. Illinois Mus. vii, p. 46. *A. botruosus*, Keokuk Group, Tennessee; MILLER (114) Bull. Illinois Mus. vi, p. 22. *A. foveatus*, Burlington Group, Sedalia, Mo.; MILLER (115) Bull. Illinois Mus. vii, p. 49. *A. obesus*, Lower Carboniferous, Burlington Limestone, Hannibal; KEYES (70) Bull. Geol. Surv. Missouri, v, p. 187 : n. spp.

Actinometra divaricata, a specimen with mouth interradial; KOEHLER (73) p. 289 : variation in position of syzygy; KOEHLER (77) p. 421. *A. multiradiata*; *l. c.* *A. parvicirra*; KOEHLER (73) p. 289. *A. pectinata*; KOEHLER (77) p. 422. *A. regalis*; *op. cit.* p. 420 : Hartlaub's account of IIIBr. confirmed in opposition to Carpenter's; KOEHLER (73) p. 292. *A. robustipinna*, variations from type due to a greater age, Amboyna; *op. cit.* p. 290. *A. sentosa*; KOEHLER (77) p. 421. *A. stelligera*, variations from type; KOEHLER (73) p. 292.

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†*Agaricocrinus*:—*A. americanus*, refigured (p. 168), *A. brevis* (p. 167), *A. pentagonus*, refigured (p. 167), *A. planoconvexus*, refigured (p. 167), *A. wortheni* (p. 168); KEYES (70).

A. arcula, Tennessee (p. 30), *A. profundus*, Tennessee (p. 26), *A. tugurium*, Brown Co., Ky. (p. 28), Keokuk Group; MILLER (114) Bull. Illinois Mus. vi: n. spp.

†*Agassizocrinus*:—*A.* sp., Stringocephalenkalk; HOLZAPFEL (61) p. 301. *A. dactyliformis*; KEYES (70) p. 221.

†*Agriocrinus*:—*A. gracilior*, Roemer, olim *Cyathocrinus* pars; JAEKEL (67) p. 105.

†*Agriocrinus*, n. g., with type *A. frechi* (p. 103), and *A. inermis* (p. 105), Lower Devonian Hunsrückschiefer of Bundenbach; JAEKEL (67) Pal. Abh. vii: n. spp.

†*Allagecrinus americanus*, base of Kinderhook Group, Louisiana, Mo.; ROWLEY (140) Amer. Geol. xvi, p. 219, n. sp.

†*Amphoracrinus*:—*A. divergens*, refigured; KEYES (70) p. 166.

A. sedaliensis, Chouteau Limestone, Sedalia, Mo.; MILLER (115) Bull. Illinois Mus. vii, p. 54, n. sp.

Antedon, discussion of the value of P. H. Carpenter's arrangement of his Groups according to number of arms, and proposed arrangement according to ambulacrals and inter-primibrachial sutures; HARTLAUB (54) p. 136. *A. abyssicola*?, 1772 fms., near Malpelo Id., G. of Panama, with a *Mucronalia* parasitic; *op. cit.* p. 146. *A. anceps*; KOEHLER (77) p. 420. *A. andersoni*, Hartlaub, description and opinion confirmed in opposition to Carpenter's; KOEHLER (73) p. 287. *A. celticus*, floating; BATHER (6). *A. crassispina* (p. 420), *A. finschii* (p. 419); KOEHLER (77). *A. imparipinna*; KOEHLER (73) p. 288. *A. ludovici*, variations from Amboyna specimen described by Hartlaub; *op. cit.* p. 286. *A. milberti*; KOEHLER (77) p. 418: large specimen; KOEHLER (73) p. 288. *A. petasus*; GRIEG (49) p. 5. *A. phalangium*; MARENZELLER (104) p. 129. *A. rhomboidea*, variations from Carpenter's *figure*; HARTLAUB (54) p. 138. *A. rosacea*, spermatogenesis; FIELD (38): development of larva; BURY (17) pp. 86–88: larva described; HORNELL (62). *A. tenella*, varying extent in Strömfjorden; GRIEG (49) p. 5. †*A. thiollierei*, from Cirin, described and figured; LORIOL (88) p. 3. *A. variipinna*; KOEHLER (77) p. 419.

A. agassizii, Mariato Point in G. of Panama, 782 fms., and Galapagos Is., 327 & 684 fms., dimorphic arm-characters, Basicurva Group; HARTLAUB (54) Bull. Mus. Harvard, xxvii, No. 4, p. 131. *A. bigradata*, Mariato Point in G. of Panama, 555 fms., and between Chatham and Hood Is., 385 fms., Tenella Group; *op. cit.* p. 145. *A. macrodiscus*, Misaki, Japan, 3 fms., Milberti Group; HARA (53) Zool. Mag. vii, p. 115. *A. parvula*, Cocos Is., 978 fms., Tenella Group; HARTLAUB (54) Bull. Mus. Harvard, xxvii, No. 4, p. 144. *A. subtilis*, Gaspar Str., Java Sea, Palmata Group; *op. cit.* p. 151. *A. tanneri*, entrance to G. of Panama, 286 fms., Eschrichti Group; *op. cit.* p. 141: n. spp.

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†*Apiocrinus ellipticus*, Santagata, see *Rhizocrinus santagatai*; CAPELLINI (18 & 19).

†*Archæocrinus knoxensis*, Trenton Group, Knox Co., Tenn.; MILLER (114) Bull. Illinois Mus. vi, p. 34, n. sp.

†*Aristocrinus*, n. g., based on *Taxocrinus concavus*, Hamilton Beds. Callaway Co., Mo. "In case the name *Aristocrinus* should prove to be preoccupied our genus could be changed to *Callawaycrinus*"; ROWLEY (140) Amer. Geol. xvi, p. 217.

†*Bactrocrinus*, maintained and defined (p. 81), *B. fusiformis*, Roemer sp. *non* Steininger, redescribed (p. 83), *B. nanus*, Roemer, olim *Poteriocrinus*, redescribed and figured (p. 85); JAEKEL (67).

B. mülleri, based on *Poteriocrinus fusiformis*, J. Müller, *non* Roemer, Middle Devonian of Gerolstein; JAEKEL (67) Pal. Abh. vii, p. 84. *B. tenuis*, based on *B. fusiformis*, Schnur in Steininger, which is distinguished from *Poteriocrinus fusiformis*, Roemer, from Middle Devonian of Gerolstein; *op. cit.* p. 82. *B. zeileri*, based on *Poteriocrinus rhenanus*, Wirtgen & Zeiler pars, Lower Devonian of Nieder-Lahnstein; *op. cit.* p. 84: n. spp.

†*Baerocrinus*, syn. of *Hoplocrinus dipentas*; JAEKEL (97) p. 93.

†*Barrandeocrinus*, fused pinnules; JAEKEL (67) p. 36.

†*Barycrinus*:—*B. hoveyi* (p. 209), *B. magnificus*, refigured (p. 210), *B. meekianus* (p. 211), *B. rhombiferus* (p. 210), *B. spurius* (p. 209), *B. stellatus* (p. 210); KEYES (70).

B. washingtonensis, Keokuk Group, Washington Co., Ind.; MILLER (114) Bull. Illinois Mus. vi, p. 49, n. sp.

†*Batocrinus*:—*B. æqualis* (p. 179), *B. æquibrachiatus* (p. 181), *B. biturbinatus* (p. 184), *B. blairi* (p. 180), *B. calvini*, refigured (p. 180), *B. christyi* (p. 181), *B. clypeatus* (p. 179), *B. dodecadactylus* (p. 183), *B. elegans* (p. 180), *B. euconus* (p. 184), *B. laura*, refigured (p. 182), *B. longirostris*, refigured (p. 180), *B. nashvillæ* (p. 183), *B. planodiscus* (p. 184), *B. pulchellus* (p. 184), *B. pyriformis*, refigured (p. 182), *B. rotundus*, refigured (p. 182), *B. subtractus* (p. 183), *B. trochiscus*, refigured (p. 181); KEYES (70).

B. arcula, St. Louis Group, Washington Co., Ind.; MILLER (114) Bull. Illinois Mus. vi, p. 16. *B. broadheadi*, Keokuk Group, Boonville, Missouri; MILLER (115) Bull. Illinois Mus. vii, p. 15. *B. burketi*, Keokuk Group, Hamilton, Ill.; MILLER (114) Bull Illinois Mus. vi, p. 19. *B. casualis*, Keokuk Group, Tenn.; *op. cit.* p. 15. *B. casula*, Keokuk Group, Little Barren R., Ky.; *op. cit.* p. 8. *B. curiosus*, Keokuk Group, Allen Co., Ky.; *op. cit.* p. 6. *B. formaceus*, Burlington Group, Sedalia, Mo.; MILLER (115) Bull. Illinois Mus. vii, p. 24. *B. heteroclitus*, Keokuk Group, Boonville, Mo.; *op. cit.* p. 31. *B. honorabilis*, Keokuk Group, Tenn.; MILLER (114) Bull. Illinois Mus. vi, p. 10. *B. ignotus*, Keokuk Group, Boonville, Mo.; MILLER (115) Bull. Illinois Mus. vii, p. 28. *B. imparilis*, Burlington Group, Sedalia, Mo.; *op. cit.* p. 20. *B. inconsuetus*, Keokuk Group, Boonville, Mo., *op. cit.* p. 25. *B. incultus*, Burlington Group. Sedalia, Mo.; *op. cit.* p. 21.

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B. inopinatus, Keokuk Group, Boonville, Mo.; *op. cit.* p. 36. *B. insperatus*, Burlington Group, Sedalia, Mo.; *op. cit.* p. 22. *B. insuetus*, Keokuk Group, Boonville, Mo.; *op. cit.* p. 14. *B. labellum*, Keokuk Group, Washington Co., Ind.; MILLER (114) Bull. Illinois Mus. vi, p. 21. *B. laciniosus*, Keokuk Group, Tenn.; *op. cit.* p. 14. *B. luterna*, Keokuk Group, White Creek Springs, Tenn.; *op. cit.* p. 12. *B. modestus* (p. 30), *B. nitidulus* (p. 17), *B. peculiaris* (p. 18), Keokuk Group, Boonville, Mo.; MILLER (115) Bull. Illinois Mus. vii. *B. pileus*, St. Louis Group, Washington Co., Ind.; MILLER (114) Bull. Illinois Mus. vi, p. 18. *B. planus*, Burlington Group, Sedalia, Mo.; MILLER (115) Bull. Illinois Mus. vii, p. 37. *B. polydactylus*, Keokuk Group, Boonville, Mo.; *op. cit.* p. 5. *B. procerus*, ditto; *op. cit.* p. 33. *B. prodigialis*, Keokuk Group, Button Mould Knob, Ky.; *op. cit.* p. 39. *B. sampsoni*, Keokuk Group, Boonville, Mo.; *op. cit.* p. 7. *B. serratus*, ditto; *op. cit.* p. 27. *B. spinosus*, Keokuk Group, Little Barren R., Ky.; MILLER (114) Bull. Illinois Mus. vi, p. 5. *B. venustulus* (p. 12), *B. veterator* (p. 8), *B. vetustus* (p. 10), *B. vicinus* (p. 34), Keokuk Group, Boonville, Mo.; MILLER (115) Bull. Illinois Mus. vii, p. 34. *B. wetherbyi*, Keokuk Group, White Creek Springs, Tenn.; MILLER (114) Bull. Illinois Mus. vi, p. 11: n. spp.

†*Belemnocrinus*? *sampsoni*; KEYES (70) p. 207.

†*Brachiocrinus nodosarius*, Hall, rediagnosed and referred to *Herpetocrinus*; BATHER (8).

†*Briarocrinus*, systematic position; JAEKEL (67) p. 38.

†*Calceocrinus*:—*C. tunicatus*, refigured, *C. ventricosus*; KEYES (70) p. 222.

†*Callawaycrinus*, syn. of *Aristocrinus*, q.v.

†*Callicrinus uralicus*, Lower Devonian, E. Ural; TSCHERNYSCHEW (162) Trudui geol. Kom. iv, p. 186, n. sp.

†*Calycanthocrinus decadactylus*, redescribed and figured; JAEKEL (67) p. 51.

†*Camerata*, defined; BATHER in WHIDBORNE (168) p. 189.

†*Carduocrinus*, n. g., with type *C. jaekeli*, based on *Lophocrinus minutus* as figured by Jaekel (67) and a specimen from the Culm of Wirminghausen in Waldeck; KOENEN (80) N. Jahrb. Min. 1895, ii, p. 210, n. sp.

†*Carpocrinus*, discussed; JAEKEL (67) p. 36.

†*Catillocrinus*, systematic position discussed; JAEKEL (67) p. 56.

†*Ceriocrinus hemisphericus*, refigured; KEYES (70) p. 220.

†*Codiacrinidæ* defined; JAEKEL (67) p. 63.

†*Codiacrinus* (p. 63), *C. granulatus* (p. 64), *C. schultzei* (p. 64); JAEKEL (67).

†*Condylocrinus*, Eichwald, redescribed, and *C. verrucosus*, described and figured; TSCHERNYSCHEW (162) p. 188.

†*Costata*, discussed; JAEKEL (67) p. 93.

†*Cotylederma lineati*, found on Ammonites; ENGEL (36) p. lxxxv.

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†*Cromyocrinus*:—*C. buttsi*, *C. globosus*, and *C. kansasensis*, the last refigured; KEYES (70) p. 216.

†*Ctenocrinus*, maintained (p. 31), *C. acicularis*, Follmann's description and figures criticised (p. 34), *C. decadactylus*, with n. var. *elegans*, Lower Devonian, Nieder-Lahnstein (p. 32, no figure), *C. rhenanus* (p. 34), *C. stellifer* (p. 34), *C. typus* (p. 32); JAEKEL (67).

C. gracilis, Gemünden (p. 35), *C. hercynicus*, Kahlenberg and Rammelsberg near Goslar (p. 33, NO FIGURE), *C. sculptus*, Oberweiler near Prüm (p. 34, NO FIGURE), Lower Devonian; JAEKEL (67) Pal. Abh. vii : n. spp.

†*Culicocrinus*, systematic position and morphology (p. 37), *C. confluentinus*, formerly *Proteuryale*, J. Müller (p. 40), *C. nodosus* (p. 39); JAEKEL (67).

C. inermis, Nieder-Lahnstein, no figure, *C. spinatus*, Hunsrückschiefer of Lorch am Rhein, Lower Devonian; JAEKEL (67) Pal. Abh. vii, p. 40 : n. spp.

†*Cupressocrinus*:—*C. abbreviatus*, and *C. crassus*, Stringocephalenkalk; HOLZAPFEL (61) p. 299. *C. crassus*, from Wolborough, figured (p. 207), *C. schlotheimii*, from Wolborough and Lummaton, described and figured (p. 209); WHIDBORNE (168).

†*Cyathocrinacea*, instituted and defined; JAEKEL (67) p. 59.

†*Cyathocrinidæ* defined; *l. c.*

†*Cyathocrinus*:—*C. boonvillensis*; KEYES (70) p. 208. *C. enormis* refigured; *l. c.* *C. gracilior*, see *Agriocrinus*. *C. grebei*, redescribed and figured; JAEKEL (67) p. 60. *C. iowensis*, refigured; KEYES (70) p. 207. *C. stillativus*, see *Phialocrinus*.

C. blairi, Chouteau Limestone (p. 67), *C. brittsi*, Burlington Group (p. 70), *C. chouteauensis*, Chouteau Limestone (p. 68), Sedalia, Mo.; MILLER (115) Bull. Illinois Mus. vii. *C. goldbecki*, Lower Devonian Hunsrückschiefer of Bundenbach; JAEKEL (67) Pal. Abh. vii, p. 62, NO FIGURE. *C. macadamsi*, St. Louis Group, Alton, Ill.; MILLER (115) Bull. Illinois Mus. vii, p. 69 : n. spp.

†*Cylicocrinus* (?) *indianensis*, Niagara Group, St. Paul, Ind.; MILLER (114) Bull. Illinois Mus. vi, p. 31, n. sp.

†*Dadocrinus gracilis*, refigured, cups of different ages, and a tegmen, described; KOENEN (81) p. 284.

†*Dendrocrinacea* instituted and defined; JAEKEL (67) p. 78.

†*Desmidocrinus* discussed; JAEKEL (67) p. 36.

†*Diamenocrinus* discussed, but not defined (p. 27), *D. gonatodes*, formerly *Rhodocrinus gonatodes*; J. Müller pars (p. 28); JAEKEL (67).

D. grandis, Silberschmelze near Ems, formerly *Rhodocrinus gonatodes*, J. Müller pars (p. 29), *D. pachydactylus*, Coblenz, formerly *Rhodocrinus gonatodes*, J. Müller pars (p. 28), *D. stellatus*, Siegburg (p. 28, NO FIGURE), Lower Devonian; JAEKEL (67) Pal. Abh. vii.

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†*Dichocrinus* :—*D. blairi*, refigured (p. 205), *D. ficus*, includes *D. coxanus*, Worthen, and *D. parvulus*, Miller (p. 204), *D. lineatus* (p. 203), *D. liratus* (p. 203), *D. striatus*, refigured (p. 203); KEYES (70).

†*Dolatocrinus* :—*D. bellulus* (p. 57), *D. corporosus* (p. 50), *D. exornatus* (p. 54), *D. hammelli* (p. 52); MILLER (114) Bull. Illinois Mus. vi. *D. nodosus*; MILLER (115) Bull. Illinois Mus. vii, p. 56. *D. pulchellus*, MILLER (114) Bull. Illinois Mus. vi, p. 55. *D. sacculus*; MILLER (115) Bull. Illinois Mus. vii, p. 58. *D. salebrosus*; *op. cit.* p. 59. *D. vasculum*; MILLER (114) Bull. Illinois Mus. vi, p. 52 : Hamilton Group, Charlestown, Ind., n. spp.

†*Dorycrinus* :—*D. chouteauensis* (p. 169), *D. cornigerus* (p. 172), *D. elegans* (p. 170), *D. gouldi*, refigured (p. 173), *D. intermedius* (p. 173), *D. kelloggi* (p. 173), *D. mississippiensis* (p. 174), *D. missouriensis*, redescribed (p. 171), *D. parvus* (p. 171), *D. subaculeatus* (p. 170), *D. unicornis*, refigured (p. 169); KEYES (70).

†*Edriocrinus pocilliformis*; KEYES (70) p. 221.

†*Emperocrinus*, n. g., with type *Emperocrinus indianensis*, Niagara Group, St. Paul, Ind.; MILLER (114) Bull. Illinois Mus. vi, p. 42, n. sp.

†*Encrinus* :—"Nov. form. indet," columnals figured and described, Muschelkalk, Val di Scalve; TOMMASI (160) p. 61. *E.*, cf. *cassianus*; SALOMON (143) p. 138. *E. gracilis*, columnals described, Italian Muschelkalk; TOMMASI (160) p. 59. *E. liliiformis*; NOVARESE (126). *E. liliiformis*, columnals described, localities in Italian Muschelkalk; TOMMASI (160) p. 60. *E. silesiacus* ?; NOVARESE (126).

E. spinosus, Schichten von Gorasdze, Unteren Muschelkalk, in Chorulla, Oberschlesien; MICHAEL (110) Jahresber. Schlesisch. Ges. lxxi, Abth. ii, p. 23. This was figured in Zeitschr. Deutsch. geol. Ges. xlv, p. 500 : n. sp.

†*Eretmocrinus* :—*E. calyculoides*, refigured (p. 177), *E. carica* (p. 176), *E. corbulis*, refigured (p. 175), *E. coronatus* (p. 176), *E. depressus*, refigured (p. 176), *E. expansus*, refigured (p. 175), *E. koninckı* (p. 178), *E. leucosia* (p. 176), *E. originarius* (p. 178), *E. remibrachiatus* (p. 178), *E. verneuillianus*, refigured (p. 177); KEYES (70).

E. commendabilis, Keokuk Group, Crawfordsville, Ind.; MILLER (114) Bull. Illinois Mus. vi, p. 25, n. sp.

†*Eucladocrinus pleuroviminus*; KEYES (70) p. 202.

†*Eupachycrinus* :—*E.* ? *harii*, refigured (p. 218), *E. magister*, refigured (p. 218), *E. maniformis* (p. 217), *E. orbicularis* (p. 217), *E. verrucosus*, refigured (p. 217); KEYES (70).

†*Fistulata* divided into *Cyathocrinacea* [*Cyathocrinidæ*, *Crotalocrinidæ*, *Euspirocrinus*, *Gasterocomidæ*, *Marsupites*], *Dendocrinacea* [= *Dendrocrinidæ* and *Decadocrinidæ* of Bather], and *Heterocrinacea* [*Heterocrinidæ*, *Calceocrinidæ*]; JAEKEL (67) p. 57.

†*Flexibilia*, n. n. pro *Articulata*, W. & Spr. *non* Müller; ZITTEL (180) p. 137.

†*Forbesiocrinus* :—*F. agassizi*, refigured, *F. wortheni*; KEYES (70) p. 224.

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†*Gastrocomidæ*, discussed; JAEKEL (67) p. 73.

†*Gastrocrinus*, n. g., based on *Poteriocrinus patulus*, J. Müller, Lower Devonian, which is redescribed; JAEKEL (67) Pal. Abh. vii, p. 80.

†*Gennæocrinus trijugis*; KEYES (70) p. 174.

†*Gilbertsocrinus*:—*G. typus*; KEYES (70) p. 164.

G. greenei (p. 35), *G. indianensis* (p. 38), Hamilton Group, Charleston, Ind.; MILLER (114) Bull. Illinois Mus. vi, n. spp.

†*Gissocrinus* ? *borealis*, Lower Devonian, E. Ural; TSCHERNYSCHEW (162) Trudui geol. Kom. iv, p. 189, n. sp.

†*Glyptocrinus fornshelli*, in Missouri; KEYES (70) p. 162.

†*Hapalocrinidæ*, n. fam. of *Costata*, including *Hapalocrinus*, *Agriocrinus*, *Thallocrinus*, and *Coccocrinus*; JAEKEL (67) p. 94.

†*Hapalocrinus*, n. g., with type *H. elegans*, Lower Devonian Hunsrückschiefer of Bundenbach; JAEKEL (67) Pal. Abh. vii, p. 95, n. sp.

†*Haplocrinus decipiens*, redescribed and figured; WHIDBORNE (168) p. 205.

†*Herpetocrinus nodosarius*, Hall, olim *Brachiocrinus*, rediagnosed; BATHER (8).

†*Hexacrinus*, rediagnosed (p. 189), *H.* ? *aberrans*, redescribed and figured (p. 199), *H. depressus*, syn. of *H. interscapularis* (p. 191); WHIDBORNE (168). *H. exsculptus*, Stringocephalenkalk; HOLZAPFEL (61) p. 302. *H. granifer* maintained; WHIDBORNE (168) p. 191. *H. granulifer* (p. 301), *H. interscapularis* (p. 302), Stringocephalenkalk; HOLZAPFEL (61). *H. interscapularis*, redescribed and figured (p. 190), *H. macrotatus*, redescribed and figured (p. 192), *H. microglyphicus*, redescribed and figured (p. 196), *H. ornatus*, redescribed and figured (p. 195), *H. pentangularis*, Austin *non* Miller, referred to *H. quintangulus* (p. 198), *H. perarmatus*, redescribed and figured (p. 194), *H. quintangulus*, redescribed and figured (p. 198), *H. vicarii*, redescribed and figured (p. 197); WHIDBORNE (168).

†*Holocrinus wagneri*, redescribed, with tegmen, specimen with regenerate arms figured; KOENEN (81) p. 290.

†*Homocrinus kayseri*, Lower Devonian Hunsrückschiefer of Wisperstein near Lorch; JAEKEL (67) Pal. Abh. vii, p. 78, n. sp.

†*Hydreionocrinus*:—*H. acanthophorus* (p. 215), *H. mucrospinus* (p. 216), *H. pentagonus* (p. 215); KEYES (70).

†*Ichthyocrinus burlingtonensis*; KEYES (70) p. 223.

†*Indianocrinus*, n. g., with type *Indianocrinus punctatus*, n. sp., Niagara Group, St. Paul, Ind.; MILLER (115) Bull. Illinois Mus. vii, p. 83.

†*Lahuseniocrinus*, n. g., with type *L. tirlensis*, n. sp., Lower Devonian, E. Ural; TSCHERNYSCHEW (162) Trudui geol. Kom. iv, p. 187. Genus rejected; JAEKEL (67) p. 18.

†*Larvata*, characters discussed; JAEKEL (67) p. 43.

†*Lecythiocrinus olliculæformis*, refigured; KEYES (70) p. 208.

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†*Lophocrinus*, redescribed (p. 90); *L. minutus*, specimen from Geistlicher Berg [Weinberg *apud* Von Koenen] near Herborn, figured, and species considered to include *L. speciosus* (p. 92); JAEKEL (67). The specimen figured by Jaekel distinguished from *L. speciosus*, Von Meyer, and made type of *Carduocrinus jaekeli*; KOENEN (80).

†*Macarocrinus*, n. g., with type *M. springeri*, Lower Devonian Hunsrückschiefer of Bundenbach; JAEKEL (67) Pal. Abh. vii, pp. 36 & 111, n. sp.

†*Macrostylocrinus indianensis*, Niagara Group, St. Paul, Ind.; MILLER (114) Bull. Illinois Mus. vi, p. 33, n. sp.

†*Mariacrinus*, maintained; JAEKEL (67) p. 31.

†*Megistocrinus*:—*M. brevicornis*, refigured (p. 165), *M. evansi*, refigured (p. 164); KEYES (70).

M. hemisphericus (p. 44), *M. ornatus* (p. 42), Hamilton Group, Clarke Co., Ind.; MILLER (115) Bull. Illinois Mus. vii, n. spp.

†*Melocrinus*, distinguished from *Ctenocrinus* and *Mariacrinus*; JAEKEL (67) p. 31. *M. gibbosus*, Stringocephalenkalk; HOLZAPFEL (61) p. 303. *M. hieroglyphicus*, from Lummaton Beds?, described and figured; WHIDBORNE (168) p. 201. *M. nodosus*, Hall, refigured; WHITFIELD (169). *M. stellaris*, from Torquay, described and figured; WHIDBORNE (168) p. 200.

M. sampsoni, Chouteau Limestone, Sedalia, Mo.; MILLER (115) Bull. Illinois Mus. vii, p. 55, n. sp.

†*Millericrinus*:—*M.* cf. *adneticus*, columnals figured, Lower Lias; PARONA (129) p. 70. *M. munsterianus*; PERON (131) p. 542.

†*Mycocrinus*, systematic position discussed; JAEKEL (67) p. 54.

M. granulatus, Middle Devonian of Prüm in the Eifel; JAEKEL (67) Pal. Abh. vii, p. 55, n. sp.

†*Myelodactylus*, name rejected in favour of *Herpetocrinus*; BATHER (8).

†*Onychocrinus*:—*O. monroensis*; KEYES (70) p. 224.

O. pulaskiensis, Kaskaskia Group, Pulaski Co., Ky.; MILLER (114) Bull. Illinois Mus. vi, p. 40, n. sp.

†*Orthocrinus*, n. g., with type *O. simplex*, Lower Devonian, Nieder-Lahnstein, formerly *Poteriocrinus rhenanus*, J. Müller pars; JAEKEL (67) Pal. Abh. vii, p. 29, n. sp.

†*Parisocrinus*, discussed (p. 64), *P. curtus* (p. 66); JAEKEL (67). *P. intermedius*; KEYES (70) p. 207. *P. stellaris*, olim *Poteriocrinus*, redescribed and figured (p. 67), *P. sæformis*, redescribed and figured (p. 65); JAEKEL (67).

P. canaliculatus, Lower Devonian, Nieder-Lahnstein; JAEKEL (67) Pal. Abh. vii, p. 68, n. sp.

Pentacrinoidea (Jaekel) divided into *Fistulata*, *Larvata*, *Articulosa*, *Articulata*, and *Costata*; JAEKEL (67) p. 42.

†*Pentacrinus*:—columnals; SALOMON (143) p. 138. *P. amblyscalaris*?; PERON (131) p. 543. *P. dubius*, columnals described, localities in

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Italian Muschelkalk ; TOMMASI (160) p. 57. *P. kloedeni* is based on cirrals of *P. agassizi* ; DEECKE (31) p. 72. *P. rotatus*, Eocene, N. Z.; TATE (157) p. 122. *P. scalaris* ; FUCINI (40) p. 140. *P. stellatus*, Eocene, N. Z. and S. Australia ; TATE (157) p. 122. *P. subbasaltiformis*, n. var. *subrotundus*, Upper Eocene, Valrovina, Italy, figured ; GREGORIO (47) p. 17. *P. subsulcatus* ; FUCINI (40) p. 141. *P. subteres*, Tithonian, Italy ; CORTI (24) p. 386. *P. tuberculatus*, columnals figured ; PARONA (129) p. 71.

†*Periechocrinus*? *whitei* ; KEYES (70) p. 164.

†*Phialocrinus* :—*P. basiliscus* (p. 220), *P. carbonarius* (p. 219), *P. harii*, refigured (p. 219), *P. magnificus*, refigured (p. 220), *P. stillativus*, White, olim *Cyathocrinus*, refigured (p. 219) ; KEYES (70).

P. barydactylus, Upper Coal-Measures, Kansas City ; KEYES (70) Bull. Geol. Surv. Missouri, v, p. 220, n. sp.

†*Phyllocrinus* :—*P.* cf. *malbosi* ; TOBLER (159) p. 265. *P.* (errore *Phylloricrinus*) *fenestratus*, *P.* cf. *mabosianus*, *P. nutantiformis*, Tithonian, Italy ; CORTI (24) p. 386.

†*Physetocrinus* :—*P. ornatus*, refigured, *P. ventricosus* ; KEYES (70) p. 192.

†*Pisocrinus* :—*P. baccula*, Niagara Group, St. Paul, Ind. (p. 79). *P. milligani*, Niagara Group, Decatur Co., Tenn., but shown by Bather to be syn. of his *P. quinquelobus* (p. 80) ; MILLER (115) Bull. Illinois Mus. vii : n. spp.

†*Platycrinus*, systematic position ; JAEKEL (67) p. 38. *P. aberrans*, referred to *Hexacrinus* ; WHIDBORNE (168) p. 199. *P. absentivus* (p. 196), *P. æqualis* (p. 200), *P. æquiternus* (p. 196), *P. allophylus* (p. 196), *P. americanus*, refigured (p. 199), *P. annosus* (p. 196), *P. bonoensis* (p. 201), *P. boonvillensis* (p. 202), *P. brittsi* (p. 195), *P. burlingtonensis* (p. 200), *P. discoideus*, includes *P. gorbyi* and *P. pulchellus* of S. A. Miller (p. 197), *P. halli*, refigured (p. 201), *P. ollicula* (p. 195) ; KEYES (70). *P. pentangularis*, Philips *non* Miller, referred to *Hexacrinus vicarii* ; WHIDBORNE (168) p. 197. *P. pileiformis*, refigured (p. 198), *P. præcuntius* (p. 198), *P. pratteni* (p. 198), *P. saffordi*, refigured (p. 202), *P. sampsoni*, Miller, "too imperfect to deserve recognition" (p. 199), *P. sarœ* (p. 202), *P. sculptus* (p. 200), *P. subspinosus* (p. 197) ; KEYES (70). *P. tuberculatus*, Phillips *non* Miller, syn. of *Hexacrinus macrotatus* ; WHIDBORNE (168) p. 193.

P. casula, Burlington Group (p. 76), *P. clinatus*, Chouteau Limestone (p. 74), *P. formosus*, Burlington Group (p. 72). *P. germanus*, Chouteau Group (p. 78), *P. missouriensis*, Chouteau Limestone (p. 73), *P. modestus*, Burlington Group (p. 77), *P. pettisensis*, Chouteau Limestone (p. 73), *P. semifusus*, Burlington Group (p. 77), *P. sulciferus*, Burlington Group (p. 75), *P. tugurium*, Burlington Group (p. 70), Sedalia, Mo. ; MILLER (115) Bull. Illinois Mus. vii. *P. vascellum*, Keokuk Group, Tennessee ; MILLER (114) Bull. Illinois Mus. vi, p. 32 : n. spp.

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†*Poteriocrinus* :—*P. brittsi* ; KEYES (70) p. 211. *P.* (olim *Cyathocrinus*) *gracilior*, see *Agriocrinus*. *P. isacobus* compared with *Plicatocrinus* ; JAEKEL (67) p. 93. *P. minutus*, see *Lophocrinus*. *P. patulus*, see *Gastrocrinus*. *P. rhenanus*, J. Müller pars, see *Orthocrinus*.

P. altonensis, St. Louis Group Alton, Ill. (p. 62), *P. blairi*, Burlington Group, Sedalia, Mo. (p. 61), *P. broadheadi*, Chouteau Limestone, Sedalia, Mo. (p. 63), *P. sampsoni*, Chouteau Limestone, Sedalia, Mo. (p. 65) ; MILLER (115) Bull. Illinois Mus. vii ; *P. vagulus*, Kaskaskia Group, Pulaski Co., Ky. ; MILLER (114) Bull. Illinois Mus. vi, p. 46 : n. spp.

†*Proteuryale confluentina*, see *Culicocrinus*.

†*Pterotocrinus* :—*P. chesterensis* ; KEYES (70) p. 206.

P. wetherbyi, Kaskaskia Group, Pulaski Co., Ky. ; MILLER (114) Bull. Illinois Mus. vi, p. 44, n. sp.

†*Ptychocrinus splendens* ; KEYES (70) p. 162.

†*Rhadinocrinus*, n. g., with type *R. rhenanus*, Lower Devonian of Coblenz ; JAEKEL (67) Pal. Abh. vii, p. 87, n. sp.

†*Rhipidocrinus*, synonymy discussed ; JAEKEL (67) p. 25. *R. crenatus* ?, from Lummaton, figured ; WHIDBORNE (168) p. 203.

†*Rhizocrinus santagatai*, not a crinoid, but = *Bathysiphon filiformis* ; CAPELLINI (18 & 19).

†*Rhodocrinus*, synonymy discussed ; JAEKEL (67) p. 25. *R.* (*Acanthocrinus*) sp., fragment from Wolborough, figured ; WHIDBORNE (168) p. 204. *R. coxanus*, refigured ; KEYES (70) p. 163. *R. gonatodes*, Müller, referred to *Diamenocrinus gonatodes*, *D. pachydactylus*, and *D. grandis* ; JAEKEL (67) pp. 24, 28 & 29. *R. wachsmuthi* (p. 163), *R. whitei* (p. 163), *R. wortheni* (p. 162) ; KEYES (70).

†*Saccocoma*, relations in Palæozoic ; JAEKEL (67) pp. 93 & 96.

†*Saccocrinus umbrosus*, Niagara Group, St. Paul, Ind. ; MILLER (114) Bull. Illinois Mus. vi, p. 24, n. sp.

†*Sampsonocrinus*, n. g., with type *S. hemisphericus*, Chouteau Limestone, Sedalia, Mo. ; MILLER (115) Bull. Illinois Mus. vii, p. 51, n. sp.

†*Scaphiocrinus* :—*S.* ? *boonvillensis* (p. 212), *S. dactyliformis* (p. 211), *S.* ? *gorbyi* (p. 213), *S. missouriensis*, refigured (p. 211), *S. proboscidialis* (p. 212), *S. rusticellus*, refigured (p. 212), *S.* ? *sampsoni* (p. 213), *S. scoparius* (p. 212) ; KEYES (70).

†*Scoliocrinus*, n. g., with type *S. eremita*, Middle Devonian of Pelm in the Eifel ; JAEKEL (67) Pal. Abh. vii, p. 76, n. sp.

†*Scytalocrinus* .—*S. dactylus*, and *S. vanhornei* ; KEYES (70) p. 213.

†*Shumardocrinus*, n. g., with type *S. concinnus*, Shumard, olim *Actinocrinus*, redescribed on a specimen from Burlington Group, Sedalia, Mo. ; MILLER (115) Bull. Illinois Mus. vii, p. 41.

†*Sphærocrinidæ*, n. fam. for *Sphærocrinus*, *Gastrocrinus*, and *Parisocrinus* ; JAEKEL (67) p. 64.

†*Sphærocrinus*, morphological description ; JAEKEL (67) p. 68. *S. geometricus* ; JAEKEL (67) p. 72 : discussed and specimens from Wolborough figured ; WHIDBORNE (168) p. 211.

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S. lævigatus, Middle Devonian of Kerpen in the Eifel; JAEKEL (67) Pal. Abh. vii, p. 72, n. sp.

†*Steganocrinus*:—*S. araneolus* (p. 194), *S. concinnus* (p. 194), *S. pentagonus*, refigured (p. 195), *S. sculptus* (p. 194); KEYES (70).

†*Storthingocrinus fritillus*, from Wolborough, figured, but English specimens referred here by J. Müller & Schultze are placed with *Hexacrinus macrotatus*; WHIDBORNE (168) p. 206.

†*Strotocrinus*:—*S. regalis*, refigured, includes *S. bloomfieldensis* of S. A. Miller; KEYES (70) p. 193.

S. blairi, Burlington Group, Sedalia, Mo.; MILLER (115) Bull. Illinois Mus. vii, p. 48, n. sp.

†*Symbathocrinus*:—*S. dentatus*, refigured (p. 206), *S. swallovi* (p. 207); KEYES (70). *S. tabulatus*, Stringocephalenkalk; HOLZAPFEL (61) p. 300. *S. wortheni*, refigured; KEYES (70) p. 206.

†*Talarocrinus simplex*; KEYES (70) p. 205.

†*Taxocrinus*:—*T. giddingei* (p. 223), *T. shumardianus* (p. 224), *T. thiemi*, refigured (p. 223); KEYES (70).

T. wetherbyi, Kaskaskia Group, Pulaski Co., Ky.; MILLER (114) Bull. Illinois Mus. vi, p. 41, n. sp.

†*Teliocrinus* maintained as distinct from *Strotocrinus*, with which S. A. Miller places it (p. 191), *T. liratus*, refigured (p. 191), *T. umbrosus* (p. 190); KEYES (70).

†*Thalamocrinidæ*, n. fam., including only *Thalamocrinus*, n. g. (p. 81), with type-species *T. ovatus* (p. 82), and *T. cylindricus* (p. 82), Niagara Group, Decatur Co., Tenn.; MILLER (115) Bull. Illinois Mus. vii: n. spp.

†*Thallocrinus retiarius*, Phillips, olim *Platycrinus*, redescribed; JAEKEL (67) p. 109.

†*Thallocrinus*, n. g., with type *T. hauchecornei*, Lower Devonian Hunsrückschiefer of Bundenbach; JAEKEL (67) Pal. Abh. vii, p. 106, n. sp.

Thylacocrinus?, a fragment from Lummaton, figured; WHIDBORNE (168) p. 202.

†*Triacrinidæ*, n. fam. consisting of *Pisocrinidæ*, Bather, and *Catillocrinidæ*, Zittel, evolution discussed; JAEKEL (67) p. 44.

†*Triacrinus*:—*T. altus*, ligament grooves in radial facet (p. 50), *T. depressus*, redescribed and figured, esp. anal tube (p. 48), *T. elongatus*, redescribed and figured (p. 46); JAEKEL (67).

†*Woodocrinus*:—*W. elegans*, refigured, and *W. pocillum*; KEYES (70) p. 214.

†*Zeacrinus*:—*Z. magnoliæformis*; KEYES (70) p. 214.

Z. blairi, Keokuk Group, Boonville, Mo.; MILLER (115) Bull. Illinois Mus. vii, p. 66. *Z. durabilis* (p. 48), *Z. pulaskiensis* (p. 47), Kaskaskia Group, Pulaski Co., Ky.; MILLER (114) Bull. Illinois Mus. vi: n. spp.

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(G).—†CYSTIDEA.

Cystidea, auctt., divided into *Thecoidea* and *Cystoidea*, the former containing *Hemicystis*, *Cytaster*, *Agelacrinus*, *Cyathocystis*, and allies; JAEKEL (68) p. 110. General account, with classification into Families: *Aristocystidæ*, *Sphæronitidæ*, *Camarocystidæ*, *Echinosphæritidæ*, *Cryptocrinidæ*, *Caryocrinidæ*, *Anomalocystidæ*, *Callocystidæ*, *Agelacrinidæ*; ZITTEL (180) p. 148.

Agelacrinus faberi, uppermost part of Hudson R. Group, halfway between Osgood and Versailles, Ind.; MILLER & FABER (113) J. Cincinnati Soc. xvii, p. 156, n. sp.

Caryocrinus kentuckiensis, Niagara Group, Louisville, Ky.; MILLER (114) p. 59, n. sp.

Comarocystites obconicus, *C. shumardi*; KEYES (70) p. 132.

Cyclocystoides illinoisensis, Hudson R. Group, Orchard Creek, Alexander Co., Ill.; MILLER (114) Bull. Illinois Mus. vi, p. 61, n. sp.

Echinodiscus kaskaskiensis; KEYES (70) p. 133. *E. sampsoni*, Miller, "almost too imperfect for recognition"; *l. c.*

Echinoencrinus armatus, see *Schizocystis*.

Holocystites asper (p. 84), *H. sphæroidalis* (p. 85), Niagara Group, Madison, Ind.; MILLER (115) Bull. Illinois Mus. vii : n. spp.

Pleurocystites mercerensis, Trenton Group, Mercer Co., Ky.; MILLER (114) Bull. Illinois Mus. vi, p. 60, n. sp.

Proteroblastus, n. g., Lower Silurian, Russia, not defined and no type-sp. mentioned; JAEKEL (68) Verh. Deutsch. Zool. Ges. 1895, p. 112.

Schizocystis, n. g., with type *Echinoencrinus armatus*, Forbes; JAEKEL (68) Verh. Deutsch. Zool. Ges. 1895, p. 113.

Stribalocystites sphæroidalis, Niagara Group, St. Paul, Ind.; MILLER (114) Bull. Illinois Mus. vi, p. 58, n. sp.

Thecoidea, see *Cystidea*.

Trochocystis cannati, imperfectly described from fragments, Middle Cambrian, Coulouma in l'Hérault, France; MIQUEL (116) Bull. Soc. Beziers, xvii, p. 9, n. sp.

(H).—†BLASTOIDEA.

General account, with classification after Etheridge & Carpenter; ZITTEL (180) p. 158.

Coduster gratiosus, Miller, "too imperfect for recognition"; KEYES (70) p. 142.

C. blairi, Chouteau Limestone, Sedalia, Mo.; MILLER (115) Bull. Illinois Mus. vii, p. 86, n. sp.

Cryptoblastus kirkwoodensis and *C. melo*, both refigured; KEYES (70) p. 139.

† All extinct.

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Granatocrinus curtus (p. 140), *G. neglectus* (p. 139), *G. norwoodi* (p. 140); KEYES (70).

G. (*Schizoblastus* ?) *magnibasis*, base of Upper Burlington Limestone, Louisiana, Mo.; ROWLEY (140) Amer. Geol. xvi, p. 220, n. sp.

Metablastus bipyramidalis (p. 137), *M. lineatus* (p. 136), *M. wortheni* (p. 137), all refigured; KEYES (70).

Orophocrinus campanulatus (p. 142), *O. stelliformis*, refigured (p. 141); KEYES (70).

Pentremites conoideus, refigured (p. 134), *P. elongatus*, refigured (p. 133), *P. godoni* (p. 136), *P. koninckanus* (p. 135), *P. obesus* (p. 135), *P. pyriformis* (p. 135), *P. sulcatus*, refigured (p. 135); KEYES (70).

Pentremitidea medusa, Lower Devonian, Hunsrückschiefer, Caub am Rhein, special description of arms; JAEKEL (67) Pal. Abh. vii, p. 12, n. sp.

Schizoblastus melonoides (p. 138), *S.* ? *roemeri* (p. 137), *S. sayi*, refigured (p. 138); KEYES (70). Vide *Granatocrinus*.

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8 A. Agassiz
with the compliments
of F. A. Bather

APR 15 1899

A Record of, and Index to the Literature of ECHINODERMA published during the years 1896 & 1897, with a few items from previous years.

Compiled by F. A. BATHER.

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TO ZOOLOGISTS AND PALÆONTOLOGISTS.

The Recorder offers hearty thanks to those Authors who have so greatly helped his labours by sending copies of their writings. He hopes that they will continue, and that their generous example will be followed by the still larger number of those who have not responded to his previous appeals.

Every paper that deals, to however slight an extent, with Echinoderms is welcome. A casual reference to some Echinoderm is often contained in a contribution to stratigraphy, faunistic distribution, or cytology; and to such writings students of the group need directing even more than to those professedly dealing with Echinoderms. These are writings which the most conscientious of recorders would be liable to miss, and yet they are the ones most rarely sent to the present compiler.

It still continues necessary to request that all reprints should bear the original pagination, the numbers of the plates and of the volume, and the correct month of publication. It is much easier for an author to give this information than for a recorder to hunt for it—often in vain.

Books and papers may be sent, either through the Editor of the "Zoological Record," or direct to

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XIV. ECHINODERMA.

(For 1896 and 1897.)

BY

F. A. BATHER.

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INTRODUCTION.

I. Titles. The larger bulk of the present list is due to three factors. First, the obvious one that it is the Record for 1896 as well as for 1897. Second, the actual increase in output of Echinoderm literature, there being 13 more titles for 1896 than there were for 1891 which was an exceptionally heavy year; 1897 too is well above the average. Third, the multiplication of Reviews, such as the Revue critique de paléozoologie and the Rivista italiana di Paleontologia, many of which contain critical notices of much value.

The list is thus composed: No date (circa 1896), 1 title; 1885, 1;

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1888, 1; 1889, 2; 1890, 1; 1891, 9; 1893, 3; 1894, 6; 1895, 19; 1896, 168; 1897, 147: Total, 358. This number is known to be incomplete, as some authors and societies persist in hiding their light under a bushel. The list also contains eight titles marked as unseen, for which fact apologies are tendered. For these and various obscure titles the Recorder has to thank the Concilium Bibliographicum at Zurich, to whose minute accuracy he is glad to bear witness. No-one would expect to find new species of Echinoids described under the title, "Os Molluscos dos terrenos terciarios da Patagonia," especially when the author of the paradox is so esteemed a zoologist as VON IHERING. The number of titles (358) is far from representing the actual number of works herein referred to, such as translations or second editions of works already recorded and analysed, as well as numerous reviews and abstracts that have appeared during the years dealt with.

It was not thought that MAYER-EYMAR'S paper (244) demanded more than one number, although it appeared in no less than seven different forms (all of which, nevertheless, are referred to). H. L. CLARK'S work on *Synapta vivipara*, however, has already necessitated four entries and will need another next year when the complete work is dealt with. Fortunately for the Recorder all authors do not multiply their papers in this alarming ratio. The trouble caused by a paper is no index of its value, as may further be seen by contrasting the entries under LUDWIG (203) and (210). *A propos* of trouble the repaging nuisance is even worse than wrong dating.

It is very doubtful whether the above analysis according to years is quite correct. Every attempt has been made to give the date of each paper with absolute accuracy, but this is not always possible. It is, however, believed that the dates assigned in the present Record are correct, especially where they differ from the apparent dates. The tendency of authors and societies is to pre-date, of publishers to post-date. As an example may be mentioned the Sitzungsberichte of the Niederrheinische Gesellschaft, for the true dates of which the Recorder is indebted to Prof. W. Voigt.

Catch-numbers to the divisions of the Subject-Index are, as before, inserted in square brackets at the end of each title. Those referring to the Systematic portion [IV, A—K] are inserted only when some question of definite importance to the systematist is dealt with in the work.

II. BIOLOGY. Slight improvements have been made in the arrangement of this section, so as to harmonise its subdivisions still further (see CONTENTS).

The papers dealt with are not only numerous but comprise many of importance. A year that saw the issue of LUDWIG'S wholly admirable monograph on Mediterranean starfish (210) and the three big volumes that represent the twenty years' work by WACHSMUTH & SPRINGER on North American Crinoidea Camerata (336) will ever be memorable to students of Echinoderma.

A. Among general evolutionary writings those of HAECKEL (116–118), though wild, are often suggestive. Valuable work based on actual examination of specimens has been done by JACKSON (139) & TORNQUIST (171) on *Palechinoidea*, by GREGORY on *Echinothuridae* (108) and *Plesiocidaroida* (110), and by LAHILLE on Scutellidae (176).

B. Anatomical researches are most abundant in the Holothurians. Here the first place is due to GEROULD'S careful study of *Caudina arenata* (100). ÖSTERGREN has begun what seems likely to prove a long series of valuable papers, chiefly on *Synallactinae* (253–255). CLARK'S work on *Synapta* would be more welcome if less scattered (53). Here also may be mentioned the notes of BARTHELS (18), IVANZOFF (138), and KOEHLER (170). DENDY, working under difficulties, has begun the study of New

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Zealand species. In *Echinoidea* the only work of importance has been done on fossils, especially by GREGORY (108, 109, 110), JACKSON & JAGGAR (139, 140), and TORNQUIST (326, 327). The writings of LAMBERT also contain many valuable notes. A small contribution to the anatomy of the generative organs in *Asteroidea* is made by LEIPOLDT (186); but for this group a storehouse of information is afforded by LUDWIG (198, 210), whose monograph is an admirable example of thorough work and lucid arrangement. The anatomy of fossil *Crinoidea* is fully described in WACHSMUTH & SPRINGER (336); BATHER (24) gives a detailed account of *Uintacrinus*; and WELLER & DAVIDSON (341) introduce too briefly a new type of arm-structure in their genus *Petalocrinus*. Among *Cystidea*, more details are needed concerning WHITEAVES' strange genus *Asterocystis* (345) now called *Steganoblastus*. The monograph of HAECKEL (119) on this Class adds little to our knowledge of their structure. Under *Blastoidea* there is little of importance except OEHLERT'S (250) restored diagram of *Pentremitidea*.

Considerable attention is paid by many authors to variation, but the only paper specially dealing with the subject is LAHILLE'S careful study of *Monophora darwini* (176).

C. The chief paper of a purely physiological nature is that by STONE (321) on the pyloric caeca of *Asterias*.

D. Observations on Bionomics are numerous but scattered. MONTICELLI (242) has studied the autotomy of *Cucumaria*; SCHIEMENZ (295) tells us how starfish open oysters; ÖSTERGREN (255) proves the locomotion of Holothurians by their anchors; MORTENSEN (244) has discovered an alga that eats the test of an Ophiurid; and LUDWIG (206) has found a new Gastropod in a *Chiridota*. WALTHER (338) discourses charmingly on the life of fossils.

E. The chief paper of Embryological interest is undoubtedly MACBRIDE'S (212) on *Asterina*; this will soon be supplemented by GOTO (see 102). ZIEGLER (355) has notes on the development of *Ophiothrix*, and CLARK (53) on that of *Synapta*. It is pleasing to see the increasing amount of attention paid to post-larval changes. Under this head are important papers by ARNAUD (15), JACKSON (139), LAHILLE (176), LAMBERT (178), MITSUKURI (238) and MORTENSEN (244); but the importance of this method of research is obvious to other workers.

Echinoderms continue as heretofore to furnish numerous data for the study of developmental mechanics. Special reference may be made to the observations of HAMMAR (123), MACBRIDE (213), ANDREWS (7 & 8) and THEEL (325), all of which show the pseudopodial activities of cells and the intimate connection between them.

III. A. The study of faunas is continued by the Prince of Monaco, and much has been done in the N. Atlantic. See KOEHLER & PERRIER. The Echinoderms of the Indian Ocean, dredged by H.M.S. 'Investigator' are in the hands of KOEHLER (167), who, it is stated, will keep all duplicates. Funafuti has not contributed much of interest (see WHITELEGGE 346). MITSUKURI (240) finds *Sphærothuria* off Japan.

B. Under Geological distribution we note a supposed *Palechinus* from the Silurian of New South Wales (MITCHELL 236); *Hapalocrinus* from the Silurian of Victoria, *Merocrinus* from the Ordovician of England, and *Uintacrinus* from the Cretaceous of England (BATHER 30, 20, 25): NOETLING (248) introduces Maestrichtian Echinoids from Baluchistan; CREMA (59) additions to the Muschelkalk fauna; OEHLERT (250) studies a Devonian fauna from Spain; and POMPECKJ, the Cambrian Cystids of Tejřovic & Skrej in Bohemia.

IV. That the amount of systematic work has been considerable may be judged from the fact that we here record the proposal of 512 new species and 82 new genera, distributed as follows :—

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	Genera		Species	
	new	hypothetical, doubtful or new names only	new	doubtful or unnamed
Holothurioidea ...	5	1	26	0
Echinoidea	19	2	112	11
Asteroidea.....	4	0	19	1
Ophiuroidea	8	0	71	2
Crinoidea	13	0	249	3
Cystidea	18	12	13	4
Blastoidea	0	0	1	0

There are also many new subgenera, new varieties, and doubtful new forms. But perhaps the most valuable piece of systematic work is that by LUDWIG on the Starfish of the Mediterranean (210), though not a single new species is described therein.

The preceding numbers are no doubt fairly correct, but the Recorder cannot be blamed if he has occasionally missed one of the numerous new names casually introduced in footnotes, reviews, and the like obscure places. The otherwise admirable papers of LAMBERT, SCHLUETER, & TORNQUIST, were particularly troublesome. The chance of error would be avoided if authors would but give a list of all new names proposed in each paper. So far is this from the case that it is sometimes quite impossible to tell whether a name is new or no.

In the matter of figuring new species the conscience of authors is awakening. Reference to such figure has been given consistently in the Systematic Index. That Index contains a reference to every definite statement made concerning a genus or species in the papers dealt with. When the name of the species is followed by no remark, it probably alludes to a statement of locality or horizon only.

Among general works ZITTEL's Grundzüge (356) and the translation by EASTMAN (357) are of value, while HAECKEL (116) is suggestive. The *Holothurioidea* are studied by DENDY (63) in New Zealand and OSTERGREN (253, 254) in Norway, while R. PERRIER (265) has valuable material from N. Atlantic, and notes of importance are furnished by KOEHLER (170) and MITSUKURI (238, 239). Recent *Echinoidea* are studied by KOEHLER (164, 168); the papers of GREGORY (108, 109), JACKSON (139), MEYER-EYMAR (224) and TORNQUIST (326, 327) on fossil *Echinoidea* have important taxonomic bearings; and detailed work is done by COTTEAU (56), GAUTHIER (98), LAMBERT (179, 180), DE LORIOL (193, 194), NOETLING (248) and SCHLUETER (296, 297). Recent *Asteroidea* are studied by DOEDERLEIN from Amboina, by FARQUHAR (83) from New Zealand, by PERRIER (263) from Bay of Biscay, and notably by LUDWIG (210); the fossils are added to by DEL PRATO (271). Recent *Ophiuroidea* are described by DOEDERLEIN (68) as above, and KOEHLER (169, 164) from Indian Ocean and Bay of Biscay; a classification of the Palæozoic genera is proposed by GREGORY (111). Fossil *Crinoidea* are largely added to by MILLER & GURLEY (232–235), while systematic work of higher order is done by WACHSMUTH & SPRINGER (336). Here also comes valuable information from JAEKEL (144), DE LORIOL (194), OEHLERT (250), and WELLER (340, 341). The *Cystidea* are dealt with by HAECKEL (118), while POMPECKJ (268) and WHITEAVES (345), add new genera.

It will be seen from the preceding summary that progress is active in all directions, while the amount of really thorough work augurs hopefully for the future. What we all want, but especially Recorders, is more study, less publication, and better arrangement of what is published.

Any further personal remarks by the Recorder are placed, as heretofore, in square brackets.

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(4, 5) Spicules and pharyngeal skeleton, *Chirodota dunedinensis* (pp. 27, 49), *Caudina coriacea* (p. 30), *Cucumaria huttoni* (p. 32), *Colochirus alba* (p. 36), *C. ocnoides* (p. 37), *C. calcarea* (p. 39), *C. brevidentis* (p. 41), *Thyonidium longidentis* (p. 46), *Stichopus mollis* (p. 48); DENDY (63).—Skeleton of Holothurians; HAECKEL (116) p. 433.—Anchors and anchor-plates of *Synapta*, *Chiridota*, *Ankyroderma*, *Trochostoma*, and others; ÖSTERGREN (255).—Spicules of *Synapta vivipara*; CLARK (53) p. 278, and figure: of *Stichopus japonicus*; MITSUKURI (238).—Bilateral plates in *Stichopus mollis*; WHITELEGGE (347).—Complete absence of spicules in

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Stichopus torvus and *S. pallens*; KOEHLER (164) p. 36.—Calcareous ring of *Caudina arenata* (p. 155); calcareous bodies and their development in *Caudina arenata* and var. *armata* (pp. 133–135); GEROULD (100).

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(7) Pseudhæmal vessels of Holothurians called 'hyponeural canals,' these = 'radial water-vessels' of Hamann in *Synapta* (p. 141); hæmal lacunæ in *Caudina arenata* (p. 168); GEROULD (100).—Cœlomic fluid with brownish-red (? hæmoglobin) and colourless corpuscles, *Caudina coriacea*; DENDY (63) p. 31.—Ciliated funnels occur in two forms in *Chirodota stuhlmanni*, and probably in *C. rigida*, as previously noted in *Synapta digitata*; LAMPERT (181) p. 70.

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(c) *ECHINOIDEA.*

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(2) Term 'lissactinic' should be 'lysactinic'; BELL (34) and GREGORY (110) p. 1001 foot-note.

(4) Stereom formation and absorption in pluteus of *Echinus miliaris*; THÉEL (325) p. 55.

(5) Skeleton:—general discussion; HAECKEL (116) p. 475.—Apical system,—classificatory value discussed, growth-stages in *Hemicidaris crenularis* as example; LAMPERT (179) p. 491 and figg. [numbers 2 & 3 transposed]: perhaps homologous with anal pyramid of *Echinocystis* and *Cystidea*; GREGORY (109) p. 132.—Form of individual apical plates in spp. of *Salenia* from Cretaceous of S. W. France; ARNAUD (15).—Genital and ocular plates of *Melonites multiporus*; JACKSON & JAGGAR (140) p. 155.—Interambulacrals and ambulacrals, esp. imbrication, spines, buccal area, jaws, of *Archæocidaris* described and discussed; TORNQUIST (326).—Ambulacral and interambulacral plates of *Melonites multiporus*; JACKSON & JAGGAR (140) p. 138.—Ambulacra, classificatory value in *Echinometridæ* discussed; LAMBERT (179) p. 488.—Ambulacral plates in Echinothuridæ, "klasma-plates" new term; GREGORY (108) p. 115.—Pyramids of Echinoid jaw perhaps arose as modified ambulacrals; GREGORY (109) p. 132.—Plastron and its growth-stages discussed, passim, and specially for *Æropidæ* (p. 323); "Petalodesmic, Cyclodesmic, and Cyclopetalodesmic," terms relating to fasciole (p. 324); LAMBERT (178).—Fossettes of *Echinoidea Endocyclica*, classificatory value discussed (p. 492); Tubercles, classificatory value in *Echinometridæ* discussed (p. 488); LAMBERT (179).—Spines of *Melonites multiporus*; JACKSON & JAGGAR (140) p. 136.

(6) Ambulacral system:—HAECKEL (116) p. 480.—Stewart's organs

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in *Sperosoma grimaldi*, *Phormosoma atlanticum*, and *Asthenosoma hystrix*; KOEHLER (168) p. 307.—Polian and other vesicles connected with "lantern" of *Regular Ech.*, term "Polian" referred to interradial vesicles above teeth-roots, so-called Stewart's organs in *Echinothuridæ* are named "Sarasin's" organs; UEXKÜLL (331).—Polian vesicles, their confusion with "zahn-blasen" and "gabel-blasen" in *Ech. regulares*, relations to the organs of Stewart and of Sarasin; LUDWIG (201).—Homologies and history of the various vesicles just mentioned; UEXKÜLL (332).

(7) Amœbocytes of cœlomic fluid in *Echinus esculentus* and *miliaris* form plasmodia, which may become reticular tissue; THÉEL (325) p. 50.

(8) Gut, pharynx and teeth; HAECKEL (116) pp. 479 & 480.—Intestinal siphon in *Echinothuridæ*; KOEHLER (168) p. 307.—Relations of jaws in *Regular Ech.* to various vesicles; UEXKÜLL (331).—Amœbocytes in *Ech.* gut; SAINT-HILAIRE (287).

(10) Mesenteries and internal muscles of *Sperosoma* and *Phormosoma*; KOEHLER (168) p. 307.—Imbrication of plates,—in *Melonites multiporus*; JACKSON & JAGGAR (140) p. 154. See also TORNQUIST (171 & 327).—Due to diminished calcification consequent on deep-sea life; GREGORY (108) p. 120.—Rounded, as well as stellate, amœbocytes connected by protoplasmic threads; MACBRIDE (213).

(12) Genital system:—HAECKEL (116) p. 481.

(d) *ASTEROIDEA.*

(1) General accounts:—with ref. to fossils in British Museum; GREGORY (112) p. 95.—With special reference to fossils; ZITTEL (356) and ZITTEL-EASTMAN (357).

(5) Skeleton:—general discussion; HAECKEL (116) p. 498.—Morphological results of study of skeleton, pedicellaria, and appendages, in Mediterranean spp.; LUDWIG (210) p. 455. See also under spp. of which a list is given in III. A. ii. Mediterranean.—Different regions and their importance in classification; PERRIER (263) p. 12.—Madreporite, growth-stages in *Pentagonaster placenta*; KOEHLER (163) p. 455.—Superambulacrals in *Plutonaster subinermis* (p. 116), in *Hacelia attenuata* (p. 299); LUDWIG (210).—Calcareous bodies in peristomial integument of *Luidia ciliaris* and *L. sarsi* (pp. 84, 104); Spicules in podia, interbrachial septa, and gut-wall of *Plutonaster subinermis* (p. 116), of *Hacelia attenuata* (p. 299), of *Ophidiaster ophidianus* (p. 312); LUDWIG (210).

(6) Ambulacral system:—HAECKEL (116) p. 501.—Podia in *Plutonaster subinermis* (p. 116), in *Pentagonaster placenta* (p. 178), in *Hacelia attenuata* (p. 299); Polian vesicles, Tiedemann's bodies in *Plutonaster subinermis* (p. 116), in *Chætaster longipes* (p. 156), in *Pentagonaster placenta* (p. 179), in *Palmipes membranacea* (p. 267); LUDWIG (210).—Papulæ; LUDWIG (198) p. 589.

(7) Blood-vascular system (p. 604); Pseudhæmal system and lacunar system of integument (p. 616); LUDWIG (198).—Lacunar system and ovoid gland, *Asterias rubens* and *Asterina gibbosa*; CUÉNOT (60).

(8) Gut; HAECKEL (116) p. 500.—Stomach and cæca of *Pentagonaster placenta* (p. 178), of *Marginaster capreensis* (p. 206), of *Asterina gibbosa* (p. 241), of *Palmipes membranaceus* (p. 266), in *Ophidiaster ophidianus* (p. 312); stomach-cæca and anus in *Plutonaster subinermis* (p. 116); LUDWIG (210).

(10) Longitudinal muscles of body-wall in *Pentagonaster placenta* (p. 178); interbrachial septa in *P. placenta* (p. 178), in *Asterina gibbosa* (p. 242), in *Palmipes lobianci* (p. 271); LUDWIG (210).

(11) See CUÉNOT (60), under d 7.

(12) Genital system:—HAECKEL (116) p. 501, & LUDWIG (198) p. 591.—Of *Luidia ciliaris* and *L. sarsi*, and its connection with side-paxillæ;

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LUDWIG (210) pp. 84, 104.—Of *Plutonaster subinermis* (p. 116), of *Pentagonaster placenta* (p. 178), of *Marginaster capreensis* (p. 206), of *Asterina gibbosa* (p. 241), of *Palmipes membranaceus* (p. 266), of *P. lobianci* (p. 270), of *Ophidiaster ophidianus* (p. 313), of *Echinaster sepositus* (p. 343); LUDWIG (210).—Sexual differences in genital organs, esp. in *Asterias rugispina*; LEIPOLDT (186).

(e) *OPHIUROIDEA.*

(1) General accounts:—with ref. to fossils in British Museum; GREGORY (112) p. 97.—With special reference to fossils; ZITTEL (356) and ZITTEL-EASTMAN (357).

(5) Skeleton:—general discussion; HAECKEL (116) p. 491.—Madreporite of *Eucladia* and other palæozoic *Oph.* (p. 1041); "Synguath," nom. nov., "the united piece formed of mouth-frame and jaw, Mundeckstück" (p. 1032); structure of arm-skeleton, especially in Palæozoic *Oph.* (p. 1029); ventral arm-plates absent from *Furcaster* (pace Stürtz) (p. 1038); GREGORY (111).

(6) Ambulacral system:—HAECKEL (116) p. 493.—Migration of hydropore in phylogeny; GREGORY (111) p. 1041.

(8) Gut:—HAECKEL (116) p. 493.

(12) Genital system:—HAECKEL (116) p. 494.

(f) *CRINOIDEA.*

(1) General accounts:—with special reference to fossil specimens in British Museum; BATHER (28) p. 98.—With special reference to fossils; ZITTEL (356) and ZITTEL-EASTMAN (357).—With tabular synopsis of Mesozoic and Palæozoic genera; KOKEN (171) p. 273.

(2) Base, orientation of small unfused plate; WACHSMUTH & SPRINGER (336) p. 153.

(5) Skeleton:—general discussion; HAECKEL (116) p. 465.—Morphological classification of skeletal elements (p. 38), Primary plates, abactinal (p. 38), actinal (p. 88), Supplementary plates (p. 105), Their value in classification (p. 154), anals (p. 124); terminology of skeletal elements (pp. 32–37); WACHSMUTH & SPRINGER (336).—Skeletal elements of *Uintacrinus* described, specially arrangement of pinnules and syzygies, fixed pinnules, interbrachials, interdistichals, and interpinnulars, and structure of arms; BATHER (24).—Pores in test of Crinoids compared with pore-rhombs of Cystidea; HAECKEL (118) p. 22.—Base, mono- or di-cyclic, value in classification (p. 154); Basals and infra-basals (p. 52), law of W. & Sp. (p. 59); Radials, term restricted, compound RR discussed (pp. 68–73), value of the latter in classification (p. 154); Orals and their homologies (pp. 88–99), value in classification (p. 155); Arms, term defined, free and fixed, terminology of brachials, types of branching (pp. 73–88); WACHSMUTH & SPRINGER (336).—Arm-branching in *Taxocrinidæ*; JAEKEL (144) p. 45.—Pinnules, value in classification (p. 155), their origin discussed (p. 160); primibrachs or costals, value in classification (p. 154); ambulacrals of arms and tegmen (p. 100); food-grooves and ambulacrals, value in classification (p. 155); Interradials, interbrachials, and interambulacrals, structure of tegmen (pp. 105–124), value of tegmen in classification (p. 154); anals and anal tube (pp. 124–139); pores in anal tube of *Fistulata* maintained (p. 114, pl. vii); WACHSMUTH & SPRINGER (336).—Summit-plates of anal tube of *Callicrinus*, sub nom. *Cryptodiscus*; WELLER (339 & 340).—Stem, and appendages (pp. 38–52); value in classification (p. 155); WACHSMUTH & SPRINGER (336).—Structure, and gradual loss of; BATHER (26) p. 298.—Convoluted organ of Palæozoic *Crin.*; WACHSMUTH & SPRINGER (336) p. 142.

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(6) Ambulacral system; HAECKEL (116) p. 467.—Ambulacra; WACHSMUTH & SPRINGER (336) p. 99.
(8) Gut; HAECKEL (116) p. 467.—Mouth; WACHSMUTH & SPRINGER (336) p. 99.—Gut of Pelmatozoa, coil dextral ("solar") in most *Crinoidea*, but believed to be sinistral ("contrasolar") in *Cladoidea* Jaekel (=Camerata), *Cystidea*, and *Blastoidea*; JAEKEL (142).—Anus, rectum, supposed respiration by pores (pp. 124–139); anus, value in classification (p. 155); convoluted organ (p. 142); WACHSMUTH & SPRINGER (336).
(9) Chambered organ and axial canals; *op. cit.* p. 140.
(10) Modes of union between plates; *op. cit.* pp. 81–84.—Articulation of brachials in *Uintacrinus*; BATHER (24) p. 989.—'Syzygy' defined and use of term 'joint' restricted; BATHER (21).—Syzygy in palæozoic and later *Crin.*; WACHSMUTH & SPRINGER (336) p. 81.—Irregular arrangement of syzygies in *Actinometra pulchella*; KOEHLER (163) p. 477.
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(g) *CYSTIDEA.*

(1) General,—short note; BATHER (28) p. 102.—Morphology of *Cystidea*; JAEKEL (143): of *Cystidea* and *Amphoridea*; HAECKEL (117): of *Amphoridea*; HAECKEL (116) p. 427.—General account; ZITTEL (356) and ZITTEL-EASTMAN (357).—Ditto, with synopsis of chief genera; KOKEN (171) p. 288.
(5) Skeleton,—of *Amphoridea*; HAECKEL (116) p. 425: of *Cystidea*, general discussion; HAECKEL (116) p. 445.—Theca of *Amphoridea*; HAECKEL (118) p. 13: of *Cystidea*; HAECKEL (118) p. 78.—Pores in plates of *Amphoridea* and *Cystidea*; HAECKEL (118) p. 19.—"Hydrophores palmées" referred to *Glyptocystidæ*; HAECKEL (118) pp. 48, 51, 53, 92–94, 152.—Number of arms of *Echinosphæra aurantium*; JAEKEL (143) p. 389.—Stem, evolution of pelmatozoan stem; BATHER (26) p. 296.—of *Mitrocystis* described; POMPECKJ (268) p. 504.
(6) Ambulacral system of *Amphoridea*; HAECKEL (118) p. 28: of *Cystidea*; HAECKEL (116) p. 449, (118) p. 89.
(7) Cœlomic cavities (p. 26) and blood-system (p. 27) of *Amphoridea*; ditto of *Cyst.* (p. 88); HAECKEL (118).
(8) Gut-system (p. 26) and subvective system (p. 24) of *Amphoridea*; HAECKEL (118).—Ditto of *Cystidea*; HAECKEL (116) pp. 448 & 449, and (118) pp. 85, 87.
(9) Nerve-system and sense organs of *Amphoridea* (p. 25); of *Cystidea* (pp. 86 & 87); HAECKEL (118).
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(12) Genital system of *Amphoridea* (p. 27); of *Cystidea* (p. 88); HAECKEL (118).—Gonopore of *Cystidea*; HAECKEL (116) p. 448.

(h) *BLASTOIDEA.*

(1) General accounts; ZITTEL (356), ZITTEL-EASTMAN (357), KOKEN (171) p. 286.—Short note; BATHER (28) p. 102.
(5) Skeleton of *Blastoidea*, general discussion; HAECKEL (116) p. 453.—Restored diagram and account of structure in *Pentremitidea*; OEHLERT (250) p. 834.
(6) Ambulacral system of *Blastoidea*; HAECKEL (116) p. 457.
(8) Gut of *Blastoidea*, and subvective system; HAECKEL (116) p. 456.
(12) Genital system of *Blastoidea*, and hypothetical structure of genital organs; HAECKEL (116) p. 458.

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(ii) Variation.

(a) In form :—of *Culcita acutispina* and *Anthenea acuta* due to imperfect preservation; WHITELEGGE (346) p. 159.

(b) In form and surface characters :—Complete study of, and measurements, as well as of jaws, in *Monophora darwini*, constituting 331·776 modes of variation; LAHILLE (176 & 177).—In spines of *Asterina regularis*; FARQUHAR (83) p. 196.—In spines on marginals of *Astropecten irregularis*; KOEHLER (163) p. 450.—In marginals and adambulacral spines of *Pentagonaster gosselini*; PERRIER (263) p. 45.—In spines and paxillæ of *Psilaster andromeda*; KOEHLER (163) p. 449.—In spines and buccal papillæ of *Ophiacantha rosea*; KOEHLER (163) p. 464.—In pedicellariæ of *Asteropsis*; FARQUHAR (83) p. 194.—Number and character of pedicellariæ in *Luidia ciliaris*; KOEHLER (163) p. 448.—In centrodorsal of *Antedon rhodanicus*; LORIOL (194) p. 123.—In spicules of *Holothuria roulei* (p. 481), *H. intestinalis* (p. 483), *Ankyroderma danielsseni* (p. 493), and *Echinocucumis typica* (p. 494); KOEHLER (163).

(c) In colour :—In life of many *Ech.*, *Ast.*, *Oph.*; PFEFFER (267).—In living *Ech.*; MEISSNER (229): *Ech.* and *Hol.*; WHITELEGGE (346).—In life and in alcohol of numerous *Ech.*, *Ast.*, *Oph.*, from G. of Rapallo; MARCHISIO (216).—In *Asterina calcar*, *Asterina sp.*, *Palmipes sp.*, and *Pentagonaster australis*; SAVILLE-KENT (290) Chromo-plate viii, pp. 243–245.

(d) Meristic variation :—(1) Variation from pentamerous symmetry,—In *Asterina gibbosa*; LUDWIG (210) p. 211.—6-, 7-, 8-rayed *Asterina regularis*, "several have more than one madreporite"; FARQUHAR (83) p. 196.—6-rayed Ophiurid, *O. annæ*, n. sp.; HONEYMAN (132) p. 265.—*Heliaster* sp., with 20 or 24 arms; HARRINGTON & GRIFFIN (124) p. 156.

(2) Reduplication or absence of parts,—Variation in position of syzygies in *Actinometra pulchella*; KOEHLER (164) p. 100 & (163) p. 477.—In interambulacrum of *Melonites*; JACKSON & JAGGAR (140) p. 151: of *M. giganteus*; JACKSON (139) p. 182 footnote.—Madreporite divided into four unequal pieces in *Asthenosoma ijimai*; YOSHIWARA (352) p. 9.—Absence of genital pores in a small *Porocidaris elegans*; KOEHLER (163) p. 472, & (164) p. 89.—Absence of anal, and consequent variation in base of *Teleiocrinus umbrosus*; WACHSMUTH & SPRINGER (336) p. 56.

(e) Abnormalities:—Incomplete calcification of apical plates in young *Salenia rejaudryi*; ARNAUD (15) p. 21.—Abnormal apex of *Catopygus fenestratus* with three genital pores, throws light on evolution of apex in *Echinolampidæ*; LAMBERT (180) p. 172.—Abnormal (? atavic) arrangement of oculars in two *Strongylocentrotus drœbachiensis*; OSBORN (252).—Pathologic atrophy and reduction of internal pores in one zone of each ambulacrum, in *Acrosalenia meslei*; GAUTHIER (98) p. 15.—A 6th ray as an abnormality, not true meristic variation, in *Ophiactis modesta* (p. 286); *Ophiothela danæ* with three arms atrophied (p. 298); DOEDERLEIN (68).—Abnormality in one ray of *Batocrinus*; MILLER & GURLEY (234) pp. 64 & 66, pl. iv.—Atrophied arm, *Cupressocrinus abbreviatus*; BEYER (38) p. 89.—Enlarged madreporite in young *Salenia rejaudryi*; ARNAUD (15) p. 22.—Anal tube, additional in *Batocrinus*, *Teleiocrinus* and *Steganocrinus*, branching in *Eutrochocrinus*, *Macrocrinus*, *Aulocrinus*, starting from basals in *Batocrinus*; WACHSMUTH & SPRINGER (336) pp. 135, 136, 138.—Abnormality in tentacles and retractor muscle of *Colochirus ocnoides*; DENDY (63) p. 38.—Abnormal larvæ of *Asterina gibbosa* with right hydrocœl developed; MACBRIDE (212) p. 368.—Double, treble, and quadruple monsters of young *Synapta vivipara*; CLARK (53) p. 281.

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(iii) Secondary Sexual Characters.

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(b) Differences of Colour:—Vacant. (See under II, B, ii, c.)
(c) Protection of Young:—Brood pouches in *Hol.*, summary, new instance in *Chiridota contorta* where genital tube itself becomes the pouch; Ludwig (204).—Care of Brood in *Psolus antarcticus* on ventral surface of sole; Ludwig (205). See also *Synapta vivipara*; Clark (51–53).

(C.) PHYSIOLOGY.

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(ii) **Circulation**:—Of fluids in the tentacles of *Caudina arenata*; Gerould (100).—Regulation of pressure by circulation of fluid in vesicles connected with lantern in *Ech.*; Uexküll (331).—Blood-corpuscles and lymphoid glands, résumé; Cuénot (61) p. 179.

(iii) **Respiration**:—"Rôle de l'eau dans la physiologie des Échinodermes"; Perrier (262) pp. 89–97.
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(b) By Pigments:—Blood-corpuscles in *Caudina arenata*; Gerould (100) pp. 166, 169.—Iron abounds in ambulacra of many Echinoderms and resp. trees of *Hol.*, and has respiratory function; Schneider (299) p. 213.

(iv) **Alimentation and Digestion**:—Absorption of food into lacunar system in *Asteroidea*; Cuénot (60).—Pyloric cæca of *Asterias vulgaris* have proteolytic, diastatic, and pancreatic (fat-splitting) ferments; Stone (321).—Amœbocytes in *Ech.* gut, *Toxopneustes lividus*, *T. drobachiensis*, *Arbacia aequituberculata*, *Sphærechinus granularis*; Saint-Hilaire (287).

(v) **Excretion**:—By wandering cells (ek-phorocytes) in *Asteria*; Masterman (218) pp. 210, 212, 214.

(vi) **Sensation**:—Irritability of mesenchyme cells in *Echinus microtuberculatus*; Driesch (75).—Psychology of *Asteroidea* and *Ophiuroidea*, based on Preyer, 1886–1887; Sterne (318).

(vii) **Miscellanea and Experimental Physiology**:—Experiments on physical conditions of life in water; Regnard (277).—Action of carbonic acid, of acetic acid, and of nicotin on *Regular Ech.*; Uexküll (331).—Development of protein crystalloids of undetermined function in nuclei of amœbocytes of *Sphærechinus granularis*; List (189).—Functions of anchors and anchor-plates of *Hol.*; Östergren (255).

(D.) BIONOMICS.

(i) **General Accounts**:—Of Echinoderma recent and fossil; Bather (26).—General remarks on *Holothurians* of Jamaica; Clark (52).

(ii) **Special habits**:—Vacant.

(iii) **Habitat**:—Influence of conditions in Triassic sea of St Cassian on *Ech.*; Gregory (110) p. 1004.—Association of spp. and genera of

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Crin. in Palæozoic and Mesozoic times contrasted; ANON (10).—Habitations of *Ech.*, popular; STERNE (317).—Habitats of Mediterranean *Ast.*; LUDWIG (210) p. 448, and under the several species, of which a list is given under III, A, ii, Mediterranean.—Of Indo-pacific *Ast.*; DOEDERLEIN (69) p. 303.—Of Indo-Pacific *Oph.*; DOEDERLEIN (68) p. 280.—On corals (*Lophohelia* and *Amphihelia*), *Actinometra pulchella* fixed by cirri; KOEHLER (164) p. 99.—Always on coral (*Amphihelia oculata*), *Ophiactis corallicola*; KOEHLER (163) p. 460, and (164) p. 75.—Coral-reefs of Ternate, *Linckia miliaris*, *Pentaceros muricatus*, *Diadema setosum*, Holothurians; KÜKENTHAL (175) pp. 46, 47, 50.—Reef type of palæozoic crinoids; FRECH (88) p. 177.—*Synapta vivipara* in seaweed on mangrove roots; CLARK (53) p. 281.—In sand, *Caudina arenata*; GEROULD (100) p. 128.—*Ophiopsila* sp. buried in sand in crowds, two arms exposed; MITSUKURI & HARA (241).—*Heliaster* in the dark, *Cucumaria* in crevices (p. 156), *Dendraster excentricus* in great numbers burrowing in sand, *Cucumaria* and "sea-stars" beneath bark on piles (p. 158); HARRINGTON & GRIFFIN (124).—Ornament of *Sphærocrinus* due to small amount of lime in water; FRECH (88) p. 178.

(iv) **Feeding**:—Algæ, crustaceans, and worms eaten by *Synapta vivipara*; CLARK (53) p. 282.—How starfish open oysters; HONEYMAN (131) p. 255.—*Astropecten* feeding on *Mollusca* by swallowing, *Asterias* on *Mollusca* and *Echinoidea* by extension of stomach and by pulling open shells by force; SCHIEMENZ (295).

(v) **Defence and Protection**:—(a) Active,—Poisoned by spines of *Diadema setosum*; KÜKENTHAL (175) p. 47.

(b) Concealment,—*Hol.* cover themselves with sea-weed, held on by anchors, notably *Ankyroderma* and *Trochostoma*; ÖSTERGREN (255) p. 158.

(c) Protective coloration: *Stichopus mollis*; WHITELEGGE (347).—(Cf. II, B, ii, c & II, B, iii, b.)

(vi) **Locomotion**:—Of *Astropecten* and *Asterias* contrasted; SCHIEMENZ (295).—Regular movements of larvae in *Ophiothrix fragilis* and *Echinus microtuberculatus*, and relation to currents of water; ZIEGLER (355) p. 143.—Travelling under sand, *Amphidetus cordatus*; ROBERTSON (280).—Movement of *Antedon* specially described; BATHER (26) p. 301, with illustration; BATHER (29) p. 664.—Plankton character of *Uintacrinus*, compared with other unstalked, and possibly locomotive crinoids; BATHER (24) p. 995.—Unstalked crinoids, general physiological classification of BATHER (24) adopted (p. 222), but *Saccocoma* placed with true Plankton (p. 211), along with *Pelagothuria*, while *Uintacrinus* and *Marsupites* may be Nekton; ancestor of *Pelmatozoa* was of the Benthos (p. 219); some Carboniferous and Liassic *Crin.* (e.g. *Pentacrinus*) are Pseudoplankton (p. 227); WALTHER (338).—Locomotion and fixation of palæozoic *Crin.*; WACHSMUTH & SPRINGER (336) p. 48.—Supposed floating, and attachment by arm-branches of Carboniferous crinoids; SMITH (312).—Swimming in *Bathyplotes natans*, probably many other *Psychropotinæ* and *Synallactinæ*; ÖSTERGREN (253) p. 353.—Burrowing in sand, *Caudina arenata*; GEROULD (100), p. 128.—Locomotion and fixation by anchors in *Synapta* and other *Hol.*; ÖSTERGREN (255).—Sticking powers of *Synapta vivipara*; CLARK (53) p. 282.

(vii) **Autotomy and Regeneration**:—General principles of Autotomy, that of Echinoderms described; FRENZEL (90), see esp. pp. 196–198.—Autotomy due to parasitic *Myzostoma*, in *Asterias richardi* and *Stolasterias neglecta*; ANON (11), GIARD (101).—Cuvierian organs of *Holothuria poli*, mechanism of ejection; BARTHELS (18).—Multiplication by division in *Cucumaria planci*, the autotomy effected by constriction,

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torsion (most common), and stretching; artificial division ("mecotomy") by ligature or cutting, successful with normally autotomous *C. planci* but not with other spp. and genera; MONTICELLI (242).

(viii) **Parasites and Commensals**:—Commensal annelid *Ophiodromus* between arms of *Asterias* and coloured to match (p. 158), a scaly annelid, Polynoid, on *Holothuria californica* and *Dermaster* (pp. 161 & 164), numerous *Entoconchidæ* in *H. californica* (p. 162); HARRINGTON & GRIFFIN (124).—Gregarine, *Lithocystis schneideri*, in body-cavity of *Echinocardium cordatum*, relation to amœboid cells; LÉGER (184); ditto, with remarks on other Sporozoa parasitic in Echinoderms; LÉGER (185).—*Lichomolgus maximus*, copepod in *Echinus esculentus*, Firth of Forth; SCOTT (300).—Crab, *Pinnaxodes chilensis* in rectum of *Strongylocentrotus albus*; MEISSNER (228) p. 87.—Gastropods parasitic on *Linckia* and a Cidarid; KÜKENTHAL (175) pp. 47, 57.—*Myzostoma* causing autotomy in *Asterias*; ANON. (11).—*Dactylococcus*, an alga parasitic on *Ophioglypha texturata* and *O. albida*, absorbing stereom; MORTENSEN (244) p. 322.—*Stylifer* (?) on *Ophiomyxa brevispina*; DOEDERLEIN (68) p. 299.—Cysts on stem, palæozoic *Crin.*; WACHSMUTH & SPRINGER (336) p. 43.—Cysts of *Myzostoma* (?) on arms of *Agaricocr. conicus*; *op. cit.* p. 502.—*Platyceras* commensal with *Pterotocr.*; *op. cit.* p. 793.—Gastropod, ? aff. *Entoconcha*, in body-cavity of *Chiridota pisanii*; LUDWIG (206).—Calcareous sponge growing on *Synapta vivipara*; CLARK (53) p. 282.

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(E.) MISCELLANEOUS.

(i) Research and Instruction:—

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(b) Methods of research:—Of fixing and staining segmenting ova; HAMMAR (123) p. 18.—Of studying larvæ of *Asterina*, osmic acid and Müller's fluid, also corrosive sublimate and glacial acetic acid, embed in celloidin, orientation of sections; MACBRIDE (212) p. 340. Rœntgen rays in investigation of Asteroid anatomy; MEEK (226).—Muscles of *Hol.* behave to methylene-blue in same way as do nerves; IWANZOFF (138).—Stupefying, killing, and staining, for Histological preparations of *Caudina arenata*; GEROULD (100) p. 125.

(c) Museum Exhibits and Collections:—Fossil Echinoderma in British Museum; BATHER (28) and GREGORY (112).—Catalogue of Mazzetti coll., *Ech.* foss.; MAZZETTI (225).—Collections of American palæozoic *Crin.*; WACHSMUTH & SPRINGER (336) pp. 4–8, & 18–21.—Collection of fossil *Crin.*, many types: GURLEY (115).

(ii) **Economics**:—Damage to oysterbeds by Starfish; SCHIEMENZ (295).—Commercial value of *Hol.* as food; GRIEVE (114).

(iii) **Bibliography**:—Papers by F. B. Meek; WHITE (343).—Reference to lists of E. Scotland Echinoderms; SIM (308).—Subject-index to literature of Rhine-provinces and Westphalia, down to 1887, with entries under "Echinodermen, Echinoideen, Asteroideen, Ophiure, Crinoideen," and under generic names; RAUFF (273).—Literature of 1891, recent *Echinoderma*, MEISSNER (227).—Abstracts of various papers published in 1893

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on Echinoderm palæontology; GAUTHIER (97).—Literature of *Echinoderma* for 1895, with abstracts; LUDWIG (200).—Ditto, for 1896; LUDWIG (211). —Reviews of various papers on segmentation and karyokinesis in *Echinoderma*; ERLANGER (79–82).—Account of recent English writings on experimental embryology; DRIESCH (74).—Literature of Developmental Mechanics, and Abstracts; MAYER (222 & 223).—Literature of Japanese *Hol.*; MITSUKURI (237) p. 405.—Bibliography of Holothurian anatomy with special reference to *Caudina arenata*; GEROULD (100) p. 183.—Bibliography of Palæozoic *Echinoids*; TORNQUIST (171) p. 726: JACKSON (139) p. 244.—Dates of Duncan "Revision of Genera...of Echinoidea" 31 Dec. 1889; of Pomel "Revue des Echinodermes" 1869; and of Desor "Echinologie helvétique"; LAMBERT (179) pp. 494, 495, 505.—Notice sur G. Cotteau; DESMAZIÈRES (65).—Literature of recent *Ast.*, with special reference to Mediterranean species; LUDWIG (216) p. 479.—Literature of Ast. of Chile and Magellan; MEISSNER (229) p. 107.—History of literature on *Crin.* esp. palæozoic; WACHSMUTH & SPRINGER (336) pp. 11–31.—Appreciation of C. Wachsmuth's work on palæozoic Crinoids; BATHER (23): and bibliography; KEYES (154).—Bibliography of *Cystidea*; HAECKEL (118) p. 170.

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(ii) **General Accounts**:—Embryology of *Echinoderma*; ROULE (283).—Echinoderm reproduction and development; BATHER (26) p. 314. —Nature of the metamorphosis of Echinoderma, the Pentactæa theory, ontogeny, &c.; HAECKEL (116) pp. 349, 361.—Development of *Synapta vivipara*; CLARK (53) p. 280.

(iii) **Formation of Gonads**:—Sexes distinct in *Chirodota dunedinensis*; DENDY (63) p. 27.—Oogenesis in *Caudina arenata*, also in parts *Cucumaria frondosa* (pp. 172–178): Spermatogenesis in *Caudina arenata* (p. 178); GEROULD (100).—Development of ova in *Asterias rugispinosa*, peculiarities correlated with temporary brood-pouch; LEIPOLDT (186).

(iv) **Oviposition, Fertilisation, and Segmentation**:—Artificial fertilisation of *Echinus esculentus*; TURBYNE in CHOPIN (49).—Fertilisation of ovum and subsequent changes in *Echinus microtuberculatus*; LAUTENBACH (183).—Breeding-period of Mediterranean *Ast.* discussed (p. 439), as also in detail under the species (*vide Asterias*, *Asterina*, *Astropecten*, *Brisinga*, *Chætaster*, *Echinaster*, *Luidia*, *Palmipes*); LUDWIG (210).—Reproduction of *Asterina gibbosa*, no protandry, ?ever parthenogenetic; LUDWIG (210) p. 241.

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Structure of Echinoid ovum, its fertilisation and karyokinesis; REINKE (278).—Researches on fertilised *Ech.* ova; KOSTANECKI (173).—Centrosomes in fertilised Echinoid ovum; KOSTANECKI (174).—Development of unfertilised ovum in *Echinoidea*; HERTWIG (128).—Position of long axis of spindle in segmenting ovum; ZIEGLER (355).—Centrosome in *Toxopneustes*, *Arbacia*, and *Asterias* sperm-ovum; WILSON (351).

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(d) Larvæ of Mediterranean *Ast.*, viz. *Asterias*, *Asterina*, *Astropecten*, *Echinaster*, *Luidia*; LUDWIG (210), pp. 339 & 340.—Development of larva and metamorphosis in *Asterina gibbosa*; MACBRIDE (212).—Development of *Asterias pallida*, orientation of larva; GOTO (102).—Paired lateral gut diverticula in Asterid larva, vestiges of notochordal rudiments; MASTERMAN (220) p. 134.

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(e) Centrodorsals in young of *Ophioglypha imbecillis* and *Ophiomusium familiare*; KOEHLER (169) pp. 303 & 305.—Neanic *Amphiura angularis*; KOEHLER (166) p. 244.—Age of Ephebic *Ophioglypha texturata*, with table of measurements; MORTENSEN (244) p. 321.

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(viii) **Developmental mechanics and Experimental Embryology**:—Account of English and American work; DRIESCH (74).—Reviews of various papers; ERLANGER (79–82).—Cell-mechanics and *Ech.* ovum; REINKE (278).—Effect of individual peculiarities in experimental embryology; DRIESCH (73).—Irritability of mesenchyme cells in developing *Echinus microtuberculatus*; DRIESCH (75).—Sperm-ovum segments into portion with spermatozoon nucleus and portion with ovum nucleus; ZIEGLER (355) p. 148.—Centrosome and central spindle in unfertilised but segmenting ova of *Asterias*; HERTWIG (127).—Ova of *Toxopneustes lividus* and *Echinus microtuberculatus* though unripe respond to approach of spermatozoa; SCHENK (294).

Echinus tuberculatus ♀ + *Strongylocentrotus lividus* ♂, study of karyokinesis; BOVERI (42).—Bastard-larvæ of *Echinus microtuberculatus* ♂ + *Sphærechinus granularis* ♀; SEELIGER (303).—*Asterias rubens* ♂ + *Echinus esculentus* ♀ and vice versa, ova lived 12 days, not stated if segmentation took place; TURBYNE in CHOPIN (49).

Restoration of balance in outer form of folded blastulæ of *Echinus* and *Asterias*, development of gut in deformed blastulæ and conditions which regulate it; DRIESCH (76).—Development of isolated blastomeres in *Strongylocentrotus lividus*; ZOJA (358).—Blastulæ of *Sphærechinus* and gastrulæ of *Asterias* chopped up to see where power of cells to form complete individuals stops; DRIESCH (72).—Cleavage of ovum under compression in *Echinus microtuberculatus*; ZIEGLER (354) p. 67.

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without segmentation of ovum; LOEB (190).—Mitosis induced in ova of *Arbacia* by concentration with magnesium chloride; NORMAN (249).—Ova of *Toxopneustes lividus* treated with diluted sea-water, removal of egg-substance, nevertheless followed by development; RAWITZ (275).—Mesenchyme formation in gastrula of *Echinus microtuberculatus* checked by addition of 1% glycerine to sea-water; ZIEGLER (355) p. 137.—Narcotisation of *Ech.* ova, and study of karyokinesis; DOFLEIN (70).

III. DISTRIBUTION.

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Baltic,—plankton, Ophiurid *Pluteus*, not found E. of Fehmarn, no other *Echinoderma*; AURIVILLIUS (17).—*Asteracanthion* and *Ophioglypha* are the only Echinoderms; BRANDT (43).

Limfjord, Denmark, *Ech.*, *Ast.*, *Oph.*, immigrant since 1884; MORTENSEN (244) p. 315.

The German seas, general account of *Echinoderma*; MARSHALL (217).—Elbe mouth, *Echinus esculentus* and *Asteracanthion rubens*; DAHL (62) p. 172.

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Scotland, E. coast,—*Echinus norvegicus*, between the Long Forties and Gt. Fisher Banks, 100 miles N.E. by E. of Aberdeen, 85 miles E. of Buchan Ness, 60 fathoms; 70–80 miles off E. Shetland, 70–80 fathoms; and 70 miles E. of Aberdeen, 75 fathoms; SIMPSON (310).—Aberdeenshire, *Echinus acutus*; SIM (309).

England, E. coast,—Lindisfarne, *Hippasterias phrygiana* vel *Pentagonaster granularis*; SUTTON (322) and DISTANT (67).—Farn Is., *Ophiocoma nigra*; SUTTON (322).—Scarborough, *Ech.*, *Ast.*, *Oph.*; GRABHAM (103).—*Uraster*, *Solaster*, and *Ophiura texturata*, dredged off mouth of R. Colne; SORBY (315) p. 168.

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dredged in quantities; SMITH (314).—Moray Firth, *Luidia sarsi*; SCOTT (302).

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French coasts, *Echinoderma*, popular; GRANGER (104).

Mediterranean *Ast.*, general discussion of horizontal distribution, both in Mediterranean and Atlantic (p. 441); bathymetric distribution (p. 446); and nature of habitat (p. 448); see also under the several spp. *Astropecten aurantiacus*, *A. bispinosus*, *A. spinulosus*, *A. pentacanthus*, et var. *serratus*, *A. jonstoni*, *Luidia ciliaris*, *L. sarsi*, *Plutonaster subinermis*, *P. bifrons*, *Odontaster mediterraneus*, *Chætaster longipes*, *Pentagonaster placenta*, *P. hystricis*, *Marginaster capreensis*, *Asterina gibbosa*, *Palmipes membranaceus*, *P. lobianci*, *Hacelia attenuata*, *Ophidiaster ophidianus*, *Echinaster sepositus*, *Asterias tenuispina*, *A. glacialis*, *A. edmundi*, *A. richardi*, and *Brisinga coronata*; LUDWIG (210).—Fauna does not include *Echinaster doriæ* and *E. tribulus*, which = *E. spinosus* of W. Atlantic coast (see IV D); LUDWIG (208).—Diagnoses of *Ast.*; LUDWIG (209).—G. of Rapallo, *Crin.*, *Ast.*, *Oph.*, *Ech.*, *Hol.*, with *Echinaster sepositus*, var. nov. *mediterraneus*; MARCHISIO (216).—Sea of Marmora, *Hol.*, *Ech.*, *Ast.*, *Oph.*, *Crin.*; OSTROUMOV (256) pp. 50 & 51 and passim.

B. of Biscay,—*Ophioglypha carnea*; between Pico and São Gorge, *Ophiactis abyssicola* and *Ophiacantha aristata*; Atlantic, *O. setosa*; Str. of Pico-Fayal, *Ophioconis forbesi*; and other Atlantic species of *Oph.* including n. spp. *Ophiocten longispinum*, *O. scutatum*, *Amphiura denticulata*, *A. longispina*; KOEHLER (165).—B. of Biscay, Echinoderms collected by the 'Caudan,' species new to locality, viz. Atlantic spp., *Odinia robusta*, *Coronaster antonii*, *Neomorphaster parfaiti*, *Pentagonaster perrieri*, *Astrogonium annectens*, *Dorigona arenata*, *D. subspinosa*, *Pontaster marionis*, *Ophioglypha ljungmanni*, *Amphiura duplicata*, *Trigonocidaris albida*, *Phormosoma placenta*, *Rhizocr. ravsoni*, *Lætmogone Wyvillethomsoni*; extra-Atlantic spp., *Ophioglypha irrorata*, *O. minuta*, *Ophiacantha rosea*, *Phormosoma luculentum*, *Ankyroderma danielsseni*; Arctic spp., *Ophiacantha bidentata*, *O. spectabilis*, *O. abyssicola*, *Ophiactis balli*, *Amphilepis norvegica*, *Echinus alexandri*, *Holothuria intestinalis*, *H. tremula*, *Echinocucumis typica*; Mediterranean spp., *Tethyaster subinermis*, *Pentagonaster placenta*; n. spp., *Zoroaster trispinosus*, *Cribrella biscayensis*, *C. caudani*, *Myxaster perrieri*, *Pentagonaster minor*, *P. kergroheni*, *Ophioglypha thouleti*, *Ophiocten ledanteci*, *Ophiactis corallicola*, *Ophioscolex retectus*, *Ophiacantha simulans*, *O. aristata*, *Ophiomitra globulifera*, *Astronyx locardi*, *Antedon flava*, *Holothuria roulei*, *Stichopus pallens*, *Benthogone rosea*, *Psolus tessellatus*; KOEHLER (163 & 164).

List of *Ast.* dredged by 'l'Hirondelle' in B. of Biscay, off Azores, and Newfoundland, with bathymetric distribution, and nature of bottom; PERRIER (263).—Azores, *Sperosoma*, n. g.; KOEHLER (168).

E. Atlantic,—Holothurians dredged by 'Princesse Alice'; HÉROUARD (126).—4020 metres, *Ophiomusium planum*; list of *Oph.* collected by 'Princesse Alice' including n. spp., *Ophiernus abyssalis*, *Amphiura richardi*, *A. grandis*, *Ophiacantha lineata*, *O. rufescens*, *O. cordifera*, and *Ophiotrema alberti*; KOEHLER (166).

Greenland, Karajak-Fjord, *Ech.*, *Ast.*, *Oph.*, *Hol.* (p. 235), and general list (p. 243); VANHOEFFEN (333).—N. Greenland, *Hol.*; BERGENDAL (37) pp. 8, 11.

Nova Scotia, list, with notes; HONEYMAN (131).—Grand Bank and B. of Fundy, *Crin.*, *Oph.*, *Ech.*; HONEYMAN (132).

Bermudas, *Hol.*, *Ast.*, *Oph.*, *Ech.*; BRISTOL (44).—Jamaica, *Hol.*; CLARK (52).—Kingston harbour, *Oreaster reticulata*, *Toxopneustes variegatus*, *Diadema setosum*, etc.; DUERDEN (77).

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(iii) Indian Ocean and adjacent Seas.

Oph. collected by 'Investigator,' preliminary note; Koehler (167): they include the following Atlantic spp., *Ophiomusium validum*, *O. planum*, *Ophiernus adspersus*, and *Ophiocamax fasciculata*; note also *Astronyx loveni* of Norway and Japan, also n. spp. of the following genera, *Ophiotypa*, *Ophiopyrgus*, *Ophiomastus*, *Ophioglypha*, *Ophiomusium*, *Ophiopyren*, *Ophiolypus*, *Ophioceramis*, *Ophiozona*, *Ophiopeza*, *Pectinura*, *Ophiactis*, *Amphiura*, *Ophiochiton*, *Ophiacantha*, *Ophiomitra*, *Ophiothrix*, *Ophiomyxa*, *Gorgonocephalus*, *Ophiocreas*; Koehler (169).

E. coast of Africa,—*Hol.* collected by Stuhlmann, incl. *H. signata*, *Chirodota rufescens*, *Orcula cucumiformis*, *Synapta ooplax*, also *Chirodota stuhlmanni*, n. sp.; Lampert (181).—*Ast.*, *Oph.*, *Ech.* coll. Stuhlmann; Pfeffer (267).

Ceylon,—*Palmipes sarasini*, n. sp.; Loriol (196) p. 11.

Amboina and Thursday Is.—*Oph.* 35 spp. of which 8 new, note specially *Ophioglypha sinensis* and *Ophiochæta hirsuta*; Doederlein (68).—*Ast.*, 26 spp. of which 1 new (*Bunaster*, n. g.), and general remarks on Indo-pacific *Ast.* esp. *Culcita*; Doederlein (69) p. 303.

(iv) Pacific Ocean and adjacent Seas.

Puget Sound, *Heliaster*, *Asterias*, *Cucumaria* (p. 156); *Dendraster excentricus*, *Asterias*, *Cucumaria* (p. 158); *Holothuria californica*, *Synapta*, *Cribrella*, *Solaster*, *Asterias*, *Ophioglypha* (p. 162); *Strongylocentrotus*, *Psolus* (p. 164); Harrington & Griffin (124).—Vancouver, *Ast.* with n. spp. *Crossaster vancouverensis*, *Asterias koehleri*, *A. saanichensis*; Loriol (196) p. 12.

Chile and Magellan, *Ast.*, incl. n. spp. *Asterias platei*, and *A. fernandensis*; Meissner (229).—Chile, *Ech.*; Meissner (228).

Kermadec Is. (Raoul or Sunday Is.), *Tripneustes variegatus*, *Echinometra lucunter*, *Ophiopeza danbyi*, *Asterias rodolphi*, *Asteropsis imperialis*, *Ophidiaster*, sp.; Farquhar (83).

New Zealand,—deep sea, *Ast.* (p. 7), *Crin.* (p. 10), *Ech.* (p. 11), *Hol.* (p. 20), *Oph.* (p. 24); Hamilton (122).—Various localities, *Echinocardium australe*, *Strongylocentrotus tuberculatus*, *S. eurythrogrammus*, *Centrostephanus rodgersi*, *Pectinura maculata*, *Amphiura pusilla*, *A. elegans*, *Astrogonium huttoni*, *Asterina regularis*, *Stichaster polyplax*, and others; Farquhar (83).—*Hol.*, revised list; Dendy (63).

New S. Wales, *Stichopus mollis*, hitherto known only from New Zealand; Whitelegge (347).—Houtman's Abrolhos, Holothurian fauna; Saville-Kent (290) p. 149.

Japan,—list of Hol., with extra-Japanese habitats quoted, and literature; Mitsukuri (237).—Sagami, *Sphærothuria bitentaculata*; Mitsukuri (240).—Echinoderms dredged by long-line in Sagami Bay, *Zoroaster*, n. sp., *Asthenosoma*, *Pourtalesia*, *Lætmogone* sp., *Metacrinus rotundus*; Ijima (137) p. 42.—Near Misaki, *Ilyodæmon ijimai*, n. sp.; Mitsukuri (239).—Shoal Hamashima in Kagoshima B., *Ophiopsila* sp. in crowds; Mitsukuri & Hara (241).—*Echinaster spinosus*, a W. Atlantic sp. found off Japan; Anon. (12).

(v) Arctic Ocean and adjacent Seas.

Inglefield Gulf, *Ech.*, *Ast.*, *Oph.*, *Crin.*; Ohlin (251) p. 204.

(vi) Antarctic Ocean and adjacent Seas.

Comparison of *Echinoderma* of deep-water and shallow-water of Kerguelen Region with those of other Regions; Murray (246).

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B. GEOLOGICAL.

(i) GENERAL.

Remarks on geological history of Echinoderms; GAUDRY (96).—General palæontological data afforded by Echinoderma, with table of distribution; HAECKEL (116) p. 359. The imperfection of the Geological record as exemplified by Crinoidea; WACHSMUTH and SPRINGER (336) p. 167.—Distribution of *Crinoidea* (p. 146), *Cystidea* (p. 158), *Echinoidea* (p. 202), *Holothurioidea* (p. 204); ZITTEL (356).—See also ZITTEL-EASTMAN (357).

(ii) CAINOZOIC.

(a) **General**:—Upper Tertiaries, British Isles, *Crin.* (p. 6), *Ech.* (p. 7), *Oph.* (p. 11), *Ast.* and *Hol.* (p. 12); BELL (33).—Discussion of geological distribution of *Ech.* in coll. Mazzetti, mostly Eocene and Miocene from Salto and Montese, Italy; MAZZETTI (225).—Tertiary of Piedmont, list of 53 spp. and vars. of *Ech.*, with *Brissopsis latissimus*, *B. craverii*, Placentian, *Linthia peolæ*, *L. cevense*, Pliocene, *Schizaster pyriformis*, Tongrian, *S. braidensis*, Placentian, *Spatangus manzonei*, Astian, n. spp.; BOTTO-MICCA (41) p. 344.

(b) **Pleistocene**:—Vacant.

(c) **Pliocene**:—Of Piacentino and Parma, Italy, *Astrogonium* sp. and *Astropecten linati*, n. sp.; PRATO (271).—Of Parma, list of *Ech.* incl. *Psammechinus monilis*, n. var. *depressa*, *Clypeaster guidotti*, n. sp.; VINASSA DE REGNY (335) p. 141.—*Echinolampas hemisphericus*, above sands with *Cyprina æqualis* of Monte Mario, Rome; MELI (230) p. 164.—Monte Mario, *Echinocyamus pusillus*; MELI (231) p. 149.—Dahra (Algeria), *Ech.*; BRIVE (45).—Central America, *Encope chilensis*; IHERING (136) p. 338.

(d) **Miocene**:—France, monograph of *Spatangus*, with list from other Miocene localities; COTTEAU (56).—Pierre-longue near Avignon, *Ech.*; DEPÉRET (64) p. 522.—Brittany, *Hipponoë* & *Echinolampas*; SEUNES (305).—Gombio, Italy, *Astropecten*; PRATO (271).—Lemberg, Galicia, *Ech.*; ŁOMNICKI (192) p. 34.—Letkés, Hungary, *Clypeaster acuminatus*, *C. reidii*, *C. sp.*; FRANZENAU (87) p. 20.

Middle Miocene, "terreno a *Clypeaster*," Calabria, *Ech.*; FUCINI (92) p. 61.—(? Helvetian) of Vigoleno and Ciano d' Enza in Piacentino, Italy, *Ech.*; VINASSA DE REGNY (334) p. 154.—Helvetian, "pietra da Cantoni," Rosignano and Vignale, Monferrato, Italy, *Ech.*, with *Pericosmus pedemontanus* and *Schizaster ozzanensis*, n. spp.; ALESSANDRI (1) pp. 69–84.—Langhian or Helvetian, Portugal, *Ech.*, n. spp., *Arbacina mutellensis*, *Scutella lusitanica*, *S. roquettei*, *Clypeaster palencaensis*, *C. mutellensis*, *C. delgadoi*, *Brissopsis lusitanicus*, *Opissaster cotteri*, and 20 other spp., discussion of age on p. 48; LORIOL (193).—"Schlier" of San Severino (Marche), *Hemipneustes italicus*; ANGELIS D'OSSAT & LUZJ (9) p. 66.

Tortonian,—Monterenzo, Bologna, *Cidaris tessurata*; SANGIORGI (288) p. 180; Near Orleansville, Algeria, lists of *Ech.*, chiefly *Clypeaster*; REPELIN (279) pp. 172–181.—Upper Burdigalian,—Ech. and Crin. with *Antedon anglesensis*, *A. pellati*, *A. allardi*, *A. fontannesi*, *A. depereti*, and *Pentacr. miocenicus*, n. spp.; LORIOL (194); Near Angles (Gard) and St.-Etienne-du-Grès (Bouches du Rhône), *Ech.* and *Crin.*, presence of *Pentacr.* columnals does not prove depth as supposed by SINARD (247, Zool. Rec. 1893); PELLAT (260).—Bas Languedoc, *Ech.* (Burdigalian), pp. 204, 205, 206, 210; (Vindobonian), pp. 218, 224, 226, 232; ROMAN (281).

(e) **Oligocene**:—Of Gaas (Landes), list of *Ast.* and *Ech.*; RAULIN (274).—Transylvania, lists of *Ech.*; KOCH (162) pp. 294, 313.—Patagonia, *Scutella patagonensis*; IHERING (136) p. 337.—Aquitanian and Langhian,

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"Globigerina Limestones," Malta, *Pentacrinus gastaldi* and 24 spp. *Ech.*; Cooke (55), pp. 510 & 511.

Middle Oligocene, "Septarien-thon," Cassel in Hesse, *Schizaster acuminatus*; Kayser (153).—Of Laufen in Berner Jura, *Ditremaster* (?) sp.; Hagmann (119).

(f) **Eocene**:—Aude, *Ech.* discussed; Lambert (179).—Saint-Palais (Charente-Inférieure), *Sismondia marginalis*, var. *minor*; Courjault (58).—Horizons of species of *Sismondia*; Fourtau (86).—Württemberg, lists of fossils, various localities; Engel (78).—Venetia, Mte Pulli, *Psammechinus* sp. (p. 144), and Roncà, *Ech.* (pp. 110 & 111); Gregorio (105).—Transylvania, lists of *Ech.* & *Crin.*; Koch (162) pp. 252, 258, 267, 271, 282.—Haskovo, Bulgaria, *Ech.*; Bontscheff (40) Table facing p. 324, pp. 326, 327, 354, 355, 368–373.—Nummulitic limestone of Albert in Roumania, *Conoclypeus conoideus* and *Conocrinus piriformis*; Popovici-Hatzeg (270) pp. 248 & 249.—Central Caucasus, *Ech.*; Fournier (85) pp. 179, 182.—Egypt, *Fibularia lorioli* and *Mistechinus mayeri*, *Euspatangus cairensis*, n. spp.; Loriol (196) p. 4.—Patagonia, *Hypechinus patagonicus*, *Echinarachnius juliensis*; Ihering (136) p. 336.

Australia, list of *Ech.*, *Ast.*, *Crin.*; Tate & Dennant (324) p. 130.—Murravian ?, Bordertown, S. Australia, *Psammechinus woodsi*, *Hemiaster planedeclivis*, *Lovenia forbesi*, *Scutellina patella*; Clark (50) p. 111.—Lower Maude series,—Lower Moorabool, Victoria, *Fibularia*; Hall (120) p. 45; Muddy Creek and Spring Creek, list of *Ech.*; Tate & Dennant (324) p. 146.—Table Cape beds, Tasmania, list of *Ech.*; Tate & Dennant (324) p. 132; & Pritchard (272) p. 143.

(iii) Mesozoic.

(a) **General**:—Oxfordian (pp. 101, 112, 118), Bajocian (pp. 110, 114), Bathonian (p. 117), Neocomian (p. 128), Aptian (pp. 132, 138), Albian (p. 140), Cenomanian (pp. 157, 163), Senonian (pp. 158, 160, 164), of Central Caucasus; Fournier (85).

(b) **Cretaceous**:—Of Seine-Inférieure, list of 144 spp. of *Ech.* including *Holaster integer* and *Micraster laxoporus*; Coulon (57).—S.W. France, list of *Salenia*, *S. heberti* from Upper Campanian of Talmont (Charente-Inf.), also *S. rejaudryi*, Lower Campanian, *S. maxima*, Mid. Campanian, and *S. pesmei*, Dordonian, all Charente, n. spp.; Arnaud (15), see esp. pp. 29 & 30.

(1) Upper:—Baltic chalk classified, with list of *Ech.* according to zones, *Brissopneustes danicus* and *B. suecicus*, n. spp.; *Marsupites* in Sweden; Schlueter (297).—Zones of, at Georgsberg, Bohemia, list of *Crin.*, *Ech.*, *Ast.*; Zahalka (353) p. 10.—Madagascar, *Ech.*; Newton (247) pp. 311, 313.

Maestrichtian,—Mari Hills, Baluchistan, *Ech.*; Nœtling (248) p. 11.

Danian,—"Craie de Ciply," discussion of *Ech.* and of geological horizon (p. 186), the following n. spp. *Cidaris montainvillensis*, *Macrodiadema ciplyensis*, *Salenia belgica*, *Gauthieria broecki*, *Rachiosoma grossouvrei*, *Cyphosoma inops*, *C. rutoti*, *Caratomus rutoti*, *Echinocorys belgicus*; Lambert (180).

Senonian,—Co. Antrim, *Ech.*, *Crin.*; Hume (134) pp. 545, 546, 551, 552, 553, 557, 559, 562, 568.—Between Sewerby and South Sea Landing, Flamborough Head, *Marsupites* has a range of about 50 feet, just above *Actinocamax quadratus*; Lamplugh (182) pp. 82 & 83.—N. Germany and Baltic, distribution of *Ech.*; Stolley (320), passim, esp. p. 272.—Lüneburg and Lägerdorf, horizons of *Ech.* esp. *Micraster* spp. discussed; Stolley (319).—Dieppe, *Micraster fortini*, n. sp.; Lambert (178) p. 328.—Elbeuf,

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Gauthieria radiata, var. *granulosa*: Dieppe, *Micraster fortini*; FORTIN (84). —Madagascar, various *Ech.* with n. spp., *Lampadaster gauthieri*, *Menuthiaster cotteaui*, *Micraster meunieri*, *Echinocorys duchesnei*, and *Infulaster boulei*; LAMBERT (178).—"*Trigonoarca* beds," Rautankupam, Pondicherri, India, *Hemiaster tamulicus*, n. sp., and *H. pullus*; KOSSMAT (172) pp. 95 & 96.—Lower Senonian,—of England and Westphalia, abundance of *Uintacrinus*; BATHER (25); Valley of Méhaigne, Belgium, *Ech.*; RUTOT (286) pp. 39, 42.—"Niobrara chalk," *Uintacrinus* at Smoky Hill near Elkader, Kansas; WILLISTON (348) p. 110, & (349).

Turonian,—"Hippurite limestone," lists of fossils with numerous *Ech.*; TOUCAS (328).—"Scaphitenpläner" of Oppeln, Silesia, *Ech.*, including *Ananchytes ovatus*; LEONHARD (187) pp. 40–42.—"Seewerkalk," N. of Klönthal, Switzerland; BURCKHARDT (47) p. 88.—"Formation des Gas," Turonian? near Chatillon-en-Diois, France, *Ech.*, *Crin.*; LORY & SAYN (197) p. 13.

Cenomanian and Turonian,—Lebanon, *Ech.* including n. spp., *Hemicidaris ghazirensis*, *Diplopodia blankenhorni*, *Psammechinus zumoffeni*, *Pyrina lamberti*, *Echinobrissus ghazirensis*, *Toxaster libanoticus*, *Linthia fraasi*, *Hemiaster ibelensis*, and *H. kfourensis*, also the following previously unrecorded from district, *Diplopodia variolaris*, *Holectypus cenomanensis*, *H. excisus*, *Enallaster delgadoi*, *Micraster decipiens*; LORIOL (195).

Cenomanian,—Ventnor, *Ech.* (p. 105), at C. La Hève, *Ech.* (p. 121), at St Jouin, *Ech.* (p. 125), Craie de Rouen, *Ech.* (p. 132), and various *Ech.* (p. 143); JUKES-BROWNE & HILL (150).—Groschowitz, *Catopygus carinatus*, and Sabschütz, *Pygurus lampas*, Silesia; LEONHARD (187) pp. 28 & 29.—El Golea, S. Algeria, *Ech.*; PERON (261).—"Chlomeker Schichten," Bohemia, *Ech.*, *Ast.*; FRIČ (91) p. 71.

(2) Lower:—Berriasian, *Ech.* (p. 49), Neocomian, *Ech.* (pp. 57 & 58) Urgonian, *Ech.* (p. 66), Albian, *Ech.* (p. 80), N. of Klönthal, Switzerland; BURCKHARDT (47).—Wealden to Albian of Barcelona, zonal lists with spp. of *Heteraster*, *Epiaster*, *Echinospatagus*, *Pseudodiadema*, *Pygaulus*, *Pyrina*, *Collyrites*, *Discoidea*, *Salenia*, *Catopygus*; ALMERA (3).

Albian,—of S.E. France, *Ech.*; KILIAN (157) pp. 792–797.—Escragnolles, Nizza, and W. Liguria, *Ech.*; PARONA & BONARELLI (258) pp. 64–66.

Aptian,—"Upper Greensand," Dorset, list of *Ech.*, *Crin.*; JUKES-BROWNE (149) p. 101.—"Chert and Greensand" of Warminster, list of *Ech.* (p. 264), "Rye Hill sand," list of *Ech.* and *Crin.* (p. 270), with note (p. 271), and doubtful *Catopygus columbarius* (p. 273); JUKES-BROWNE (148).—Of S.E. France, *Ech.*; KILIAN (157) pp. 752–771.—Gault of La Palud-de-Moustiers (Basses-Alpes), *Ech.*; KILIAN (158) p. 894.—Zapatoca in Cordilleras of Bogota, *Toxaster raulini*; GERHARDT (99) pp. 132, 189.

Neocomian and Upper Greensand,—*Ech.* in drift at Moreseat, Aberdeen; SHARMAN & NEWTON (306) p. 254.—Neocomian of Isère, *Eugeniacr. gevreyi*, n. sp.; LORIOL (196) p. 24. Valanginian and Hauterivian,—of Escragnolles (Alpes-maritimes); KILIAN & ZURCHER (160) pp. 963–965; Of Bas-Languedoc, *Ech.*, *Crin.*; ROMAN (281) pp. 124, 130, 135.—Valanginian, Hauterivian, Barremian of Moustiers Ste-Marie (Basses-Alpes), *Ech.*; KILIAN & LEENHARDT (159) pp. 973–980.—Of S.E. France, *Ech.*, *Crin.*; KILIAN (157) pp. 721–729, 733–737, & 738–746.

(c) **Jurassic**:—Württemberg, lists of fossils, various localities; ENGEL (78).

(1) Upper:—Inowrazlaw, Posen, occurrences of *Ech.*, *Crin.*; GALLINEK (93).—Tithonian,—of Bas-Languedoc, *Crin.*, *Ech.*; ROMAN (281) pp. 87, 88, 329; Tunis, *Metaporhinus convexus*, and *Proholaster auberti*, n. g. et sp.; GAUTHIER (98) p. 17.—Portlandian, Tithonique,—at Sisteron (Basses-Alpes) and other localities in S.E. France, *Ech.*, *Crin.*; KILIAN (157) pp. 678–688.—? Kimeridgian,—S. Tunis, *Pygurus meslei*, *Hemicidaris*

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seguellensis, *Acrosalenia meslei*, n. spp.; *Holectypus corallinus*, *Monodiadema cotteaui*, *Rhabdocidaris? orbignyana*; and *Millericrinus meslei*, n. sp.; GAUTHIER (98).

(2) Middle:—Oxfordian to Portlandian,—of Escragnolles (Alpes-maritimes), *Ech.*, *Crin.*; KILIAN & ZURCHER (160) pp. 960–962.—Oxfordian,—St Ives, Hunts., *Pseudodiadema jessoni*, n. s.; GREGORY (107).—Tunis, *Cyclolampas volzi*, *Collyrites friburgensis*, *Pleurodiadema stutzi*; GAUTHIER (98) p. 19.—Crinoid Limestone with *Pentacr. jurensis* associated with *Hildoceras bifrons*; STEFANO (316) p. 195.—"Terrain à Chailles" and Rauracian of Isteiner Klotz, S.W. Baden, *Ech.*, *Ast.*, *Crin.*; HUG (133) pp. 392, 403–405.—Callovian and Oxfordian,—Bas-Languedoc, *Crin.*, *Ech.*; ROMAN (281) pp. 55 & 65.—Callovian,—Acque Fredde, Lago di Garda, Italy, 4 spp. of *Cidaris*, indet. spines; PARONA (257) pp. 394 & 395.—Lower Callovian, Chanasien, Savoy, list of *Crin.* and *Ech.* with comparative distribution (p. 46), and notes (p. 78); PARONA & BONARELLI (259).

(3) Lower:—Madagascar, *Stomechinus* aff. *bigranularis*; NEWTON (247) p. 315.—Bathonian,—boulders of Malm in W. German plain contain *Crin.* columnals and *Cidaris* plates, origin discussed; SCHLUETER (298).—Braun Jura,—"*Murchisonæ* beds, *Sowerbyi* beds, *Humphriesi* beds," Baden, *Ech.*, *Ast.*, *Crin.*; SCHALCH (293) pp. 574, 585, 604.—Bajocian,—Bas-Languedoc, *Crin.*, *Ech.*; ROMAN (281) p. 47.

(d) **Lias**:—(?) Madagascar, *Pentacr.* and *Acrosalenia*; NEWTON (247) p. 315.

Upper,—"Lower *Leda ovum* beds," *Archæodiadema thompsoni*, n. g. et sp.; GREGORY (106).

Middle,—"Bündner Schiefer," between Hinter- and Vorderrhein, *Pentacr.* cf. *basaltiformis*; ROTHPLETZ (282) pp. 34 & 54.

Lower,—"Bündner Schiefer" between Hinter- and Vorderrhein, *Pentacr. angulatus*, *P. psilonoti*; ROTHPLETZ (282) pp. 35 & 54.—"*Planorbis* beds," Kalksburg near Vienna, *Pentacr.* cf. *psilonoti*; TOULA (330) p. 218.

(e) **Trias**:—"Brachiopodenkalk" of Grignagebirge, S. Alps, *entrochus*; PHILIPPI (266) p. 716.—Muschelkalk,—near Jena, *Crin.*, *Ech.*, *Ast.*, *Oph.* list with horizons (p. 100) and references, *passim*; WAGNER (337).—Of Recoaro, *Aspidura italica*, and *Apiocrinus recubariensis*, n. spp.; CREMA (59). Ditto, *Millericrinus*; BATHER (27). — G. of Ismid, Asia Minor, *Encrinus*; TOULA (329) p. 158.

(iv) PALÆOZOIC.

(a) **General**:—Distribution of Crinoidea Camerata in Palæozoic rocks of N. America, and comparison with other localities (p. 171), range in time of all *Crinoid* families (p. 172), followed by description of all American *Camerata*; various localities described (pp. 19 & 20); WACHSMUTH & SPRINGER (336).—Geological history of N. American *Actinocrinidæ*; MILLER & GURLEY (234) p. 73.—List of Palæozoic Crinoids of Cornwall, all stem-fragments, *Cyathocrinus* (?) *carinatus*, and *C.* (?) *leptos*, n. spp.; COLLINS (54).

(b) **Permian.** Vacant.

(c) **Permo-Carboniferous.** Vacant.

(d) **Coal Measures**:—Upper,—of Poteau Mt., Indian Territory, and Scott Co., Arkansas, *Crin.* (pp. 236, 274): Lower,—White Co. and Pope Co., Arkansas, *Crin.* (pp. 236, 275); SMITH (313).

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(d & e) Carboniferous, Kansas, complete list of *Crin.* & *Ech.*; BENNETT (36) p. 271.

(e) **Lower Carboniferous**:—*Crin.* as zonal fossils: BATHER (19). —*Archæocidaris urei*, "not found before below the Upper Grey Limestone," found at base of Lower Brown Limestone at Craig-adwy-wynt, N. Wales; MORTON (245) p. 59.—Central France, *Ech.* with n. spp., *Archæocidaris grüneri*, *Palæchinus lacazei*, *P. rutoti*, *P. robineti*, *P. koninckı* and *P. gaudryi* (pp. 125–131), and *Crin.*, *Actinocr.* and *Poteriocr.* (pp. 135–138); JULIEN (151).—Fresh horizon for palechinoids in Belgium; LOHEST (191).—"Petit-granit," Modave, Belgium, *Crin.*; DORLODOT (71) p. 252.—Stage V a, Pair, Belgium, *Platycrinus münsterianus*, *P. cf. planus*; DESTINEZ (66).—Culm and Carboniferous Limestone, *Archæocidaris*; LEYH (188) p. 540.—"Schief-erigen Kohlenkalk facies," Ober-Elsass, chiefly Hunsrückenwald, *Ech.*, character of the fauna discussed (p. 787), incl. *Palechinus lacazei*, *Rhoechinus elegans*, *Archæocidaris urii*, and n. spp., *Pholidocidaris tenuis* and *Leptechinus gracilis*; other Carboniferous *Ech.* also discussed; TORNQUIST (327).

Geological history of N. American spp. of *Agaricocrinus*; MILLER & GURLEY (235) p. 9.—Louisiana Limestone to Upper Burlington, table showing range of *Crin.* and *Blast*: KEYES & ROWLEY (156) p. 30–33.—Bridger Mts., Bozeman, Montana, n. spp. of *Poteriocr.* and *Platycr.* (vide IV F) MILLER & GURLEY (234).—Ditto, *Batocr.*, *Rhodocr.*, *Platycr.*, *Dichocr.*; MILLER & GURLEY (235).

Kaskaskia,—Pulaski Co., Ky., *Poteriocr.*, *Zeacr.*; Dover Hill, Ind., *Zeacr.*; MILLER & GURLEY (232).—Monroe Co., Ill., *Poteriocr.*; Randolph Co., Ill., *Agassizocr.*; MILLER & GURLEY (233).—Breckenridge Co., Ky., *Talarocr.*, MILLER & GURLEY (235).

St. Louis,—Lanesville, Ind., *Batocrinus*; Spergen Hill, Ind., *Steganocr.*, *Barycr.*; MILLER & GURLEY (232)—Alton, Ill., *Poteriocr.*; MILLER & GURLEY (233).

Warsaw,—Jersey Co., Ill., *Forbesocr.*; MILLER & GURLEY (232).—Salem, Ind., *Batocr.*; MILLER & GURLEY (233).

Keokuk,—Washington Co., Ind., *Forbesocr.*, Crawfordsville, Ind., *Taxocr.*; MILLER & GURLEY (232).—Boonville, Mo., *Batocr.*, *Poteriocr.*; Jersey Co., Ill., *Forbesocr.*; Edwardsville, Ind., *Forbesocr.*; Keokuk, Ia., *Batocr.*; Crawfordsville, Ind., *Barycr.*; Chert Hill, Ala., *Dorycr.*; Little Barren R., Ky., *Batocr.*; MILLER & GURLEY (234).—Keokuk, Ia., *Agaricocr.*; MILLER & GURLEY (235).

Burlington,—Adams Co., Ill., *Batocr.*, *Agaricocr.*, *Symbathocr.*, *Platycr.* (232); *Batocr.*, *Agaricocr.* (233); *Batocr.* (234): Burlington, Ia., *Strotocr.* (232); *Batocr.* (233); *Actinocr.*, *Dorycr.*, *Batocr.*, *Cyathocr.* (234): Sagetown, Ill., *Batocr.* (234): near Sharon, Mo., *Batocr.*, *Dorycr.*, *Steganocr.*, *Platycr.* (235): Sedalia, Mo., *Batocr.*, *Amphoracr.*, *Actinocr.* (232); *Batocr.*, *Actinocr.* (233); *Actinocr.*, *Physetocr.*, *Dorycr.*, *Batocr.*, *Barycr.*, *Codaster* (234); MILLER & GURLEY.

Kinderhook,—Le Grand, Iowa, List of *Crin.* and *Blast.*, mode of occurrence; BEYER (39) pp. 223–225: *Scaphiocr.*; MILLER & GURLEY (233).—Louisiana, Mo., horizons of *Crin.* and *Blast.*; KEYES (155) pp. 363 & 366.

Chouteau Limest.,—Sedalia, Mo., *Amphoracr.*, *Rhodocr.* (233); *Amphoracr.* (234); *Actinocr.* (235); MILLER & GURLEY.

(f) **Devonian**:—General distribution Echinoderms; FRECH (89) p. 120.

Middle,—"Pilton, Croyde and Braunton Beds," Devonshire, list of *Ech.*, *Ast.*, *Oph.*, *Crin.*, including 14 insufficiently described n. spp.; WHIDBORNE (342) pp. 376 & 377.—Haina near Waldgirm, *Crin.*, *Ech.*; BEYER (38) p. 88.—"Lenneschiefer" Crinoid-bed, near Attendorn, Westphalia, *Crin.*; HUNDT (135) p. 219.—(?Lower or Middle) Sta. Lucia, Spain,

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Megistocr. waliszewskii, *Stortingocr. haugi.*, n. spp., *Cupressocr.*, *Codiacr. granulatus*, *Pentremitidea*; OEHLERT (250) p. 818 et sqq.

Lower,—Oakhampton and Treborough, Devon, Crinoid columnals; HICKS (130) p. 456. — "Riffkalk," E. Alps, *Eucalyptocr.*, *Rhipidocr.*, *Hexacr.*, *Cupressocr.*, *Coccocr.* (p. 177); *Ctenocr. typus* probably does not occur in the Upper Coblenzian; "Asterscheid" should be "Asterstein" (p. 179); FRECH (88).

Upper,—Portage and Ithaca groups, spp. of *Taxocrinus*, *Poteriocrinus*, and *Arthroacantha*; KINDLE (161).

Lower,—Hamilton group, Charleston, Ind., *Megistocr.*, *Stereocr.* (235); *Dolatocr.* (232, 233, 235); MILLER & GURLEY.—Rio Mæcurú, Amazons, *Ctenocrinus* (?) columnals; KATZER (152) p. 209.

(g) **Silurian**:—General distribution Echinoderms; FRECH (89) p. 64. —L. Temiscaming outlier, Ottawa, *Crin.*; AMI (4) p. 158.

Niagara,—Decatur Co., Tenn., *Thysanocr.* (232); *Caryocr.* (233); *Glyptaster*, *Eucalyptocr.* (234): Louisville, Ky., *Lecanocr.* (232); MILLER & GURLEY.—Jones Co., Iowa, *Petalocrinus mirabilis* and *P. major*, n. spp.; WELLER & DAVIDSON (341).—Joliet, Illinois, n. spp. of Cryptodiscus (q.v. sub. IV F); WELLER (339); others from Racine, Wis.; WELLER (340).

"Middle Trilobite bed" (=Yass beds of David), at Bowning Village, Co. Harden, N. S. W., *Palæchinus*; MITCHELL (236).—Melbourne, *Hapalocrinus victoriæ*, n. s.; BATHER (30) p. 337.

(h) **Ordovician**:—General distribution Echinoderms; FRECH (89) p. 63.

"Keisley Limestone," Upper Bala, *Sphæronis pyriformis*, and various crinoid stems; REED (276) pp. 82, 93.—"Middleton group," Mincop, W. Shropshire, *Merocrinus salopiæ*, n. s., and another crinoid; BATHER (20). —Portraine, Co. Dublin, *Glyptocystis cf. Logani*; GARDINER, REYNOLDS & REED (95) pp. 524, 538.

Calciferous,—Phillipsburgh, Quebec, *Palæocystis* (p. 115); Chazy, Quebec, —St. Dominique, *Bolboporites* (p. 117); Abbotsford, *Bolboporites*, *Blastoidocr.* (p. 118); Grande Ligne, *Blastoidocr.*, *Palæocystis* (p. 118); Id. of Montreal, *Malocystis*, *Palæocystis*, *Blastoidocr.*, *Glyptocystis*, *Bolboporites* (pp. 119, 121 & 122); Joliette, *Palæocystis* (p. 120); Caughnawaga, *Blastoidocr.*, *Bolboporites*, *Glyptocystis* (pp. 122 & 123); AMI (5).

Trenton,—various localities in Quebec, *Crin.*, *Cyst.*, compiled list (p. 144), Joliette, *Glyptocrinus* (p. 147); AMI (5).—Of Ottawa Valley, list of *Crin.*, *Cyst.*, *Ast.*; AMI (4) p. 154.—Ottawa, *Astrocystis ottawaensis*, n. g. et sp.; WHITEAVES (345).—Galena-Trenton and Black R.,—L. Winnipeg, *Crin.*, *Cyst.*, *Ast.* fragments; WHITEAVES (344) p. 159.

Cincinnati group,—spp. of *Reteocr.*, *Canistocr.* [sic], *Xenocr.*, *Ptychocr.*, *Glyptocr.*, and *Mariacr.*, second-hand descriptions; JAMES (146).

Larapintine series,—Middle Valley, Central Australia, Crinoid stems, one figured [with 5 longitudinal sutures and most peculiar articular surface]; TATE (323) p. 113.

(k) **Cambrian**:—Tejřovic and Skrej, Bohemia, *Cyst.* and *Edrioast.*, incl. *Stromatocystis*, n. g.; POMPECKJ (268) p. 502–508.—Ditto, localities for *Mitrocystis*, *Lichenoides priscus*, *Stromatocystis*, and *Trochocystis bohemicus*, q.v. in IV G; JAHN (145).—Tremadoc fossils, new locality at Hof, Bavaria, *Macrocystella bavarica*; POMPECKJ (269).

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IV. SYSTEMATIC.†

(A.)—ECHINODERMA IN GENERAL.

Systematic Synopsis; BELZUNG (35) pp. 503 & 504.

Classification into Holothurides, Echinides, Stellérides, Crinoides, and Radiolaires, the last being associated by reason of their ground-plan, no distinction recognized between Protozoa and Metazoa; VILLOT (334, 1 April, 1891).

Divided into *Pelmatozoa*, *Asterozoa*, and *Echinozoa*, the last incl. *Hol.*; ZITTEL (356) p. 113.

Classification of Echinoderma, its principles (p. 368); HAECKEL (116). System of *Echinoderma*; HAECKEL (118) p. 164: thus expressed by HAECKEL (116) p. 378:

Cladomes	Classes	Sub-classes
I Monorchonia (Noncincta)	Amphoridea	Amphoralia, Amphoronia
	Thuroidea	Paractinota, Actinopoda
	Cystoidea	Microplacta, Megaplacta
II Pentorchonia orocincta	Blastoidea	Eublastoida, Parblastoida
	Crinoidea	Palaecrinida, Neocrinida
III Pentorchonia pygocincta	Echinidea	Palechinida, Autechinida
	Ophiodea	Palophiura, Colophiura
	Asteridea	Palasterida, Colasterida

Anolena, a physiological grouping of armless classes, *Cyst.*, *Blast.*, *Hol.*, *Ech.*; HAECKEL (116) p. 373.

Monorchonia, sub-phylum nov., includes *Holothurioidea*, = *Anactinogonidiata* Bell; HAECKEL (116) p. 371 & (117) p. 403.

Olenata, a physiological grouping of armbearing classes, *Crin.*, *Ast.*, *Oph.*; HAECKEL (116) p. 373.

Orocincta, super-class nov., includes *Blast.* and *Crin.*; HAECKEL (116) p. 372 & (117) p. 403.

Pentorchonia, sub-phylum nov. = *Actinogonidiata*, Bell; HAECKEL (116) p. 372 & (117) p. 403.

Pygocincta, super-class nov., includes *Ech.*, *Ast.* and *Oph.*; HAECKEL (116) p. 373 & (117) p. 403.

(B.)—HOLOTHURIOIDEA.

List of Japanese species; MITSUKURI (237).

Relations of *Hol.* to *Cystidea*; HAECKEL (118) p. 8.

† A dagger prefixed to the trivial name of a species indicates that it is fossil; prefixed to the name of the author, it denotes that the reference is to the species in a fossil state; prefixed to the name of a genus, it indicates that all species of the genus here recorded are fossil, and the † is therefore not repeated before each name. The abbreviations *l. c.* and *op. cit.* refer only to the place or work quoted *immediately* before. *Ibid.* is used when the locality and horizon are the same as those of the preceding item.

A name and reference quoted without further statement (*e.g.* "*Ankyroderma danielsseni*; HÉROUARD," on p. 59) indicate that the quoted author's statement refers merely to locality or some question of slight importance. Further information can usually be gleaned from the cross-references to II and III, given under TITLES.

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Holothuroidea, sub nomine *Thuroidea*, defined and discussed; HAECKEL (116) p. 429.

Classification of Holothurians thus given by HAECKEL (116) p. 442:

		Orders	Families
I Paractinota (Paractinopoda)		Archithuriæ	Protholothurida, Palæothurida
		Synaptonia	Synaptida, Trochodotida
		Nectothuriæ	Pelagothurida
II Actinopoda (Actinota)	Dendrothuriæ	Dendrochirota	Cucumarida, Psolida, Rhopalodinida
		Molpadonia	Molpadida, Caudinida
	Aspidothuriæ	Elasipoda	Psychropotida, Deimatida, Elpidida
		Aspidochirota	Stichopoda, Sporadipoda

Actinopoda, sub-class defined; HAECKEL (116) p. 440.

Ankyroderma,—anchors and anchor-plates; ÖSTERGREN (255) p. 156, fig.—*A. danielsseni*; HÉROUARD (126), p. 165: B. of Biscay, notes on spicules; KOEHLER (163) p. 492: Spicules, redescr.; KOEHLER (164) p. 118.—*A. jeffreysii*, no muscular tubules in integument; GEROULD (100) p. 133.

†*Archithuriae*, hypothetical ancestral group, defined; HAECKEL (116) p. 439.

Aspidochirota, order defined; HAECKEL (116) p. 443.

Bathyplotes, n. g., with type *Bathyplotes natans* (olim *Stichopus*) Sars, redescr., spicules figd, anatomical notes (p. 351); genus includes also *Stichopus moseleyi*, and *S. pourtalesii* Theel (p. 355), and *S. tizardi* Theel, redescr., respiratory trees, calcareous ring, and spicules figd; ÖSTERGREN (253) Festskrift för Lilljeborg, p. 354.

B. fallax, Bergen, respiratory trees figured; ÖSTERGREN (253) *op. cit.*, p. 355, n. sp.

Benthodytes janthina; HÉROUARD (126) p. 164.

B. glutinosa and *B. lingua*, N. Atlantic, precise localities, depths, and figg. not given; PERRIER (265) C.R. Ac. Paris, cxxiii, p. 902, n. spp.

Benthogone, n. g., with genotype *B. rosea*, n. sp., 1300 m., 50° 22′ W., 44° 2′ N., B. of Biscay, allied to *Lætmogone*; KOEHLER (163) Rev. biol. Nord France, vii, p. 488, & (164) Ann. Univ. Lyon, xxvi, p. 113, figg. 2, 3, 36, 37.—*B. rosea*, nn. varr. *cylindrica* et *quattuorlineata*, N. Atlantic; PERRIER (265) p. 900.

Caudina arenata et var. *armata*, detailed account of anatomy and histology, with bibliography; GEROULD (100).—*C. coriacea*, redescribed with internal anatomy; DENDY (63) p. 29.

Chiridota contorta, brood-pouch; LUDWIG (204).—*C. dunedinensis*, spicules, pharyngeal skeleton, and internal anatomy, described and figd, distinguished from *C. australiana* (p. 26), and spicule-growth (p. 49); DENDY (63).—*C. lævis*, 20 cm. long, Egedesminde, N. Greenland; BERGENDAL (37) p. 11.—*C. pisanii*, with parasitic Gastropod; LUDWIG (206).—*C. rufescens*; LAMPERT (181) p. 67.

C. stuhlmanni, Tumbatu, E. coast Africa, allied to *C. rigida*, ciliated funnels dimorphic; LAMPERT (181) Mt. Mus. Hamburg, xiii, p. 67, n. sp.

Colochirus alba Hutton sp., redescr. and figd, with internal anatomy; DENDY (63) p. 35.—*C. anceps*, Roebuck B., W. Australia, photograph

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of a living group; SAVILLE-KENT (290) p. 218.—*C. brevidentis* Hutton sp., redescr., and spicules figd; DENDY (63) p. 40.

C. calcarea on sea-weed in Cook Strait, N. Z. (p. 38), *C. ocnoides*, New Brighton, N. Z., with description of internal anatomy (p. 36); DENDY (63) J. Linn. Soc. XXVI, n. spp.

Cucumaria; HARRINGTON & GRIFFIN (124).—*C. crucifera*, brown spicules of Semper rediscovered in one specimen, not in the other; LAMPERT (181) p. 60.—†*C. dubiosa*; BELL (33) p. 12.—*C. frondosa*, embryonic stages as plankton, off N. Greenland; BERGENDAL (37) p. 8: walls of stomach (pp. 148, 150, 152), muscles of circumoral water-ring (p. 158), gonads (pp. 171, 175), genital duct (p. 180); GEROULD (100): vide *Pentacta*.—*C. pentactes*; MARCHISIO (216), p. 4.—*C. planci*, autotomy; MONTICELLI (242).—*C.* ? *thomsoni* and *C.* ? *turbinata*; DENDY (63) p. 34.

C. huttoni, Oamaru, N. Z., with description of internal anatomy; DENDY (63) J. Linn. Soc. XXVI, p. 32, n. sp.

Cucumariidæ, relations to *Molpadiidæ*; GEROULD (100) p. 180.

Cuvieria fabricii; HONEYMAN (131), p. 258.

Dendrochirota, order defined; HAECKEL (116) p. 441.—Number and arrangement of tentacles too variable to be a good classificatory character; LAMPERT (181) p. 63.

Echinocucumis alba Hutton, referred to *Colochirus*; DENDY (63) p. 35.—*E. typica*, variation from type in form of spicules; KOEHLER (163) p. 493: var. nov. *abyssalis*, 650 m., 4° 25′ W., 44° 36′ N., B. of Biscay; KOEHLER (164) Ann. Univ. Lyon, XXVI, p. 119.

Elasipoda, order defined; HAECKEL (116) p. 441.

Eucyclus maintained; LAMPERT (181) p. 63.

Euphronides auriculata (p. 901), *E. talismani* and *E. violacea* (p. 902), N. Atlantic, precise localities, depths, and figg. not given; PERRIER (265) C.R. Ac. Paris, CXXIII, n. spp.

Halithuria, n. g. = "*Holothuria* sensu strictissimo!! = *Sporodipus* = *Trepang*"; HAECKEL (116) p. 443.

Holothuria albiventer, has penetrated from Red Sea to Suez, is distinct from *H. aculeata*, *H. bowensis*, and *H. modesta*, *pace* Hérouard; LAMPERT (181) p. 55.—*H. argus*; WHITELEGGE (346) p. 161.—*H. armata* Selenka is a stage or var. of *Stichopus japonicus*; MITSUKURI (238).—*H. aspera*, vide *Mesothuria*.—*H. atra*; WHITELEGGE (346) p. 161: ? var. *amboinensis*; LAMPERT (181) p. 56.—*H. cinerascens*, anatomical notes; LAMPERT (181) p. 55.—*H. ecalcarea* Sars; ÖSTERGREN (253) p. 356: referred to *Stichopus*, perhaps = *S. tremulus*; ÖSTERGREN (254) p. 9.—*H. erinaceus*, maintained, spicules figd; LAMPERT (181) p. 57.—*H. forskali*, including *H. nigra*, is distinct from *H. poli* and has Cuvier's organ; KOEHLER (170).—*H. glaberrima*, distinct from *H. lubrica*, *H. erinaceus*, and *H. parva*, spicules figd; LAMPERT (181) p. 57.—*H. imitans*, colour and spicules, Funafuti; WHITELEGGE (346) p. 161.—*H. impatiens*; LAMPERT (181) p. 54.—*H. intestinalis*, includes *H. verrilli*, has variable spicules; KOEHLER (163) p. 482, and (164) p. 106: var. *verrilli*; HÉROUARD (126) p. 163.—*H. lactea*, redescr., from B. of Biscay, includes *H. thomsoni* and possibly *H. murrayi*; KOEHLER (163) p. 478, and (164) p. 102: vide *Mesothuria*.—*H. lubrica*, maintained, spicules figured; LAMPERT (181) p. 58.—*H. maculata*; LAMPERT (181) p. 54.—*H. mammata*; MARCHISIO (216) p. 4.—*H. monacaria*; LAMPERT (181) p. 54.—*H. murrayi*, vide *Mesothuria*.—*H. nigra*, is synonym of *H. forskali* and has Cuvier's organ; KOEHLER (170) p. 507.—*H. pardalis*; WHITELEGGE (346) p. 161: including *H. insignis*, *H. lineata*, and *H. peregrina* Ludwig, but not *H. pardalis*? *juv.* of Semper, 1868, pl. XXX, fig. 30; LAMPERT (181) p. 52.—*H. parva*, anatomical notes, distinct from *H. glaberrima*,

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spicules figured; LAMPERT (181) p. 56.—*H. pervicax*, colour; LAMPERT (181) p. 53.—*H. polii*; HÉROUARD (126) p. 164; MARCHISIO (216) p. 4: origin of gonads; RUSSO (284): (=*H. nigra*) Cuvierian organs; BARTHELS (18): is distinct from *H. forskali*, does not occur on Atlantic seaboard, and has no Cuvier's organ; KOEHLER (170).—*H. robsoni*; DENDY (63) p. 48.—*H. sanctori*; MARCHISIO (216) p. 4.—*H. scabra* (p. 54); *H. signata*, perhaps=*H. edulis* Lesson, has same spicules (p. 53); LAMPERT (181).—*H. stellati*; HÉROUARD (126) p. 163.—*H. thomsoni*, vide *Mesothuria*.—*H. tremula*; KOEHLER (163) p. 483, and (164) p. 108: in only 10 fms; APPELLÖF (13) p. 6: referred to *Stichopus*; ÖSTERGREN (254) p. 7.—*H. tubulosa*; HÉROUARD (126) p. 164; IWANZOFF (138): has no Cuvier's organ; KOEHLER (170) p. 509.—*H. vagabunda*; WHITELEGGE (346) p. 161.—*H. verrilli*, referred to *Mesothuria* and compared with *M. intestinalis*; ÖSTERGREN (253).

H. roulei, 1300 m., Bay of Biscay, 5° 22′ W., 44° 2′ N., allied to *H. intestinalis*, has variable spicules; KOEHLER (163) Rev. biol. Nord France, vii, p. 480, and (164) p. 105, fig. 47, n. sp. Vide *Mesothuria*.

Ilyodæmon ijimai, Sagami Bay and outer part of Tokyo Bay, over 250 fathoms; MITSUKURI (239) Annot. zool. Japon. i, p. 133, n. sp.

Lætmogone violacea; PERRIER (265) p. 900.—*L. wyville-thomsoni*, colour and shape in living state; KOEHLER (164) p. 117: Bay of Biscay, slight variations from Theel's description; KOEHLER (163) p. 492.

Mesothuria, rediagnosed, and to it are referred following species—*aspera* (?), *intestinalis*, *lactea*, *magellani*, *multipes*, *murrayi*, *roulei* (?), *thomsoni*, *verrilli*; ÖSTERGREN (253) p. 351.—*M. intestinalis* (olim *Holothuria*) Ascan., redescribed, with figures of spicules, anatomical notes; ÖSTERGREN (253) p. 347.

Molpadiidæ, relations to *Cucumariidæ*; GEROULD (100) p. 180.

Molpadonia, order defined; HAECKEL (116) p. 441.

Müllería echinites; LAMPERT (181) p. 59; WHITELEGGE (346) p. 160.—*M. mauritiana*, colour; LAMPERT (181) p. 59.

Nectothuriæ, order founded for *Pelagothuria*; HAECKEL (116) p. 440.

Oneirophanta mutabilis; PERRIER (265) p. 900.

Orcula cucumiformis, additions to previous description; LAMPERT (181) p. 61.

Paractinota, sub-class defined; HAECKEL (116) p. 438.

Peniagone, restricted; PERRIER (265) p. 901.—*P. azorica*; HÉROUARD (126) p. 164; PERRIER (265) p. 901.

P. porcellus, N. Atlantic, precise locality and depth not given and no figures; PERRIER (265) C.R. Ac. Paris, cxxiii, p. 901, n. sp.

Pentacta frondosa; HONEYMAN (131) p. 258. Vide *Cucumaria*.

Periamna, n. g., including *Peniagone naresi* (genotype), *Scotoplana insignis*, *S. robusta*, and a n. sp. *Periamna roseum*, N. Atlantic, precise locality and depth not given and no figures; PERRIER (265) C.R. Ac. Paris, cxxiii, p. 901.

Pseudocucumis africana, with young form, incl. *P. théeli* Ludwig, discussed; LAMPERT (181) p. 61.

Pseudostichopus villosus, HÉROUARD (126) p. 164.

Psolus antarcticus, care of brood; LUDWIG (205).—*P.* (*Cuvieria*) *fabricii*; VANHOEFFEN (333) p. 242.—*P. phantapus*; *loc. cit.*; HONEYMAN (131) p. 257; †BELL (33) p. 12.

P. macquariensis, Macquarie Is., N. Z.; DENDY (63) J. Linn. Soc. xxvi, p. 41.—*P. tessellatus*, 1700 metres, 6° 15′ W., 45° 47′ N.; KOEHLER (164) Ann. Univ. Lyon, xxvi, p. 119: n. spp.

Psychropotes buglossa, and *P. fucata*, N. Atlantic, precise localities and depths and figures not given; PERRIER (265), C.R. Ac. Paris, cxxiii, p. 902.—*P. grimaldii*, 4020 m., E. of São Miguel, 38° 9′ N., 11° 36′ W. (Paris), spicules figd; HÉROUARD (126) pp. 164, 167 : n. spp.

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Scotoplana, restricted; PERRIER (265) p. 901.

S. delagei, 1165–1385 metres, near Azores, spicules figured; HÉROUARD (126) pp. 164, 167, n. sp.

Sigmodota, n. g. for spp. of *Chiridota* with sigmoid spicules; ÖSTERGREN (255), Bergens Mus. Aarbog, 1896, No. 12, p. 154, footnote.

Sphærothuria bitentaculata, found off Japan; MITSUKURI (240).

Stichopus ecalcareus (olim *Holothuria*) Sars., perhaps = *S. tremulus*; ÖSTERGREN (254) p. 9.—*S. japonicus*, change in spicules with advancing age, includes *Holothuria armata* as var., also var. nov. *australis*; MITSUKURI (238).—*S. mollis* Hutton sp., redescr. and figd, with internal anatomy and spicules, includes *S. sordidus*, Theel; DENDY (63): first recorded from N. S. Wales, colour, external anatomy; WHITELEGGE (347).—*S. regalis*; IWANZOFF (138); KOEHLER (163) p. 488, & (164) p. 113.—*S. tizardi*, redescr. with figures, from B. of Biscay; KOEHLER (163) p. 484, & (164) p. 108, figg. 33–35.—*S. torvus* Theel, probably a *Meseres*; ÖSTERGREN (253) p. 357.—*S. tremulus* (olim *Holothuria*) Gunn., redescr., internal anatomy causes change of genus, figures of spicules; ÖSTERGREN (254) p. 7.—*S. variegatus*; LAMPERT (181) p. 59.

S. griegi, 80–100 fms., W. of Utvaer in S.W. Norway, with anatomical notes and figures of spicules; ÖSTERGREN (254), Bergens Mus. Aarbog, 1896, No. 12, p. 4.—*S. pallens*, 1300 m., 5° 22′ W., 44° 2′ N., B. of Biscay, has no spicules; KOEHLER (164), Ann. Univ. Lyon, xxvi, p. 111, figg. 1 & 45; & (163), Rev. biol. Nord France, vii, p. 486: probably a *Meseres*; ÖSTERGREN (253) p. 357.—*S. richardi*, 351 m., B. of Biscay, spicules figd; HÉROUARD (126) pp. 164 & 165 : n. spp.

Synallactes, discussed; ÖSTERGREN (253) p. 356.—*S. lactea*; HÉROUARD (126) p. 164.

S. théeli, based on specimens not named by Théel, "Challenger Rep. Holothurioidea," ii, p. 242; ÖSTERGREN (253), Festskrift för Lilljeborg, p. 356, n. sp.

Synallactinæ, removed from *Holothuriidæ* to *Elpidiidæ*; ÖSTERGREN (253) p. 357.

Synapta beselii; LAMPERT (181) p. 64.—*S. digitata*; HÉROUARD (126) p. 165; KOEHLER (163) p. 494, & (164) p. 121.—*S. girardi*, structure of genital tubules; GEROULD (100) p. 172.—*S. inæqualis*, holotype destroyed; DENDY (63) p. 26.—*S. lappa*, anchors and anchor-plates; ÖSTERGREN (255) p. 150, fig.—*S. ooplax*, spicules described, anatomical notes; LAMPERT (181) p. 66.—*S. picta*, Théel, probably syn. of *S. vivipara*; CLARK (53) p. 282.—*S. serpentina*, colour, anatomical notes, number of tentacles; LAMPERT (181) p. 64.—*S. uncinata*, holotype redescr. with internal anatomy; DENDY (63) p. 25.—*S. vivipara*, general description, spicules figd, development, habitat, food; CLARK (53).

Synaptidæ, distinctive characters; GEROULD (100) p. 181.

Synaptonia, order defined; HAECKEL (116) p. 439.

Synaptula, syn. of *Synapta*; CLARK (53) p. 282.

Thyone brevidentis Hutton, referred to *Colochirus*; DENDY (63) p. 40.—*T. briareus*, structure of genital tubules; GEROULD (100) pp. 171 & 172.—*T. inermis*; HÉROUARD (126) p. 165.

Thyonidium longidentis Hutton sp., redescr. and figd, includes *T. caudatum* Hutton, and *T. rugosum* Théel; DENDY (63).

Trochostoma, anchors and anchor-plates; ÖSTERGREN (255) p. 158, fig.—*T. antarcticum*, no muscular tubules in integument; GEROULD (100) p. 133.—*T.* (*Molpadia*) *oolitica*; HONEYMAN (131) p. 258.

Tutela, n. g. with genotype *T. echinata*, N. Atlantic, precise locality and depth not given, and no fig.; PERRIER (265), C.R. Ac. Paris, cxxiii, p. 901, n. sp.

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(C.)—ECHINOIDEA.

Defined (p. 474), classified (p. 481), with Stammbaum (p. 489), and the following system (p. 488); HAECKEL (116):

Sub-class	Legions	Orders	Families
I Cystechinida	——	Promelonaria	Procidarida, Cystocidarida
		Eumelonaria	Melonitida, Pholocidarida
II Palechinida	——	Stenopalmaria	Bothriocidarida
		Eurypalmaria	Lepidocentrida, Archæocidarida, Plesiocidarida
Autechinida (= Euechinoidea)	Demosticha (= Cidaronia v. Regularia)	Cidaridaria	Eocidarida, Cidarida
		Diademaria	Echinothurida, Salenida, Glypticida, Cyphosomida, Arbacida, Echinometrida, Typechinida
	Anthosticha (= Clypeastronia v. Subregularia)	Conoclyparia	Galeritida, Conoclypeida
		Scutellaria	Fibularida, Clypeastrida, Laganida, Scutellida
	Petalosticha (= Spatangonia v. Atelostoma, v. Irregularia)	Cassidularia	Echinonida, Cassidulida, Collyritida, Eolampada
		Spatangaria	Ananchytida, Pourtalesida, Leskiada, Spatangida, Brissida

Tabular synopsis of Neozoic genera; KOKEN (171) p. 256.

General account, with special reference to fossils; ZITTEL (356) p. 174; ZITTEL-EASTMAN (357) p. 210.

Palæozoic *Ech.* are thus classified by JACKSON (139) p. 238: Sub-class I, *Palæechinoidea.* Order 1, *Bothriocidaroida*; 2, *Perischoechinoida.* Families, *Melonitidæ*, *Lepidesthidæ*, *Archæocidaridæ*, *Lepidocentridæ*; 3, *Cystocidaroida*; 4, *Plesiocidaroida.* Family, *Tiarechinidæ.* Sub-class II, *Euechinoidea*, a few spp. of *Cidaris.*

†*Acrosalenia*, vide sub *Gauthieria.*

A. meslei, Kimeridgian, Ksar-Dagra near Tatouine, S. Tunis, one specimen shows pathological reduction of pores; GAUTHIER (98) pp. 14, 16, pl. xxxii, n. sp.

†*Actinophyma*, syn. of *Rachiosoma*; LAMBERT (179) p. 498.

†*Actinopsis* (errore *Actinopis*), nom. nov. pro *Asteropsis* Cotteau non Müller & Troschel, genotype *A. lapparenti*, and comprising *Cyphosoma arnaudi*, subgenus *Heteractis*, q. v.; LAMBERT (179) p. 500.

A. (*Heteractis*) *heteroporus*, Eocene, La Vornede, near Conques, Monze, La Valette, between Pradelles and Monze (Aude); LAMBERT (179) Bull. Soc. geol. France, ser. 3, xxv, p. 507, pl. xviii, n. sp.

Aeropidæ, fam. nov. with 4 tribes: Stenoniens, *Stenonia*, *Menuthiaster*; Ovulasteriens, *Physaster*, *Ovulaster*, *Ornithaster*, *Coraster*; Neopneu-

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stiens, *Neopneustes*, *Homolampas*, *Aceste*, *Palæobrissus*, *Genicopatagus*; Paleotropiens, *Cleistechinus*, *Palæotropus*, *Argopatagus*; LAMBERT (178) p. 324.

†*Agassizia equipetala*, probably not British; BELL (33) p. 10.

Amphidetus cordatus; ROBERTSON (280): vide sub *Echinocardium*.

Amphiope bioculata and *A. perspicillata*, compared in terms of variations noted in *Monophora darwini*; LAHILLE (176) p. 439.—†*A. palpebrata*, redescribed, from Portugal, compared with *A. lovisatoi* and *A. villei*; LORIOL (193) p. 14, pls. iii & iv.

†*Ananchytes*:—*A. artatus* (pp. 159, 161), *A. cf. beaumonti* (p. 162), *A. carinatus* (p. 164), *A. conoideus* (p. 160); FOURNIER (85).—*A. crasissima* Ag. is syn. of *A. conoideus* Goldf.; LAMBERT (180) p. 185.—*A. cf. douvillei* (pp. 161, 163), *A. gibbus* (p. 164), *A. ovatus* (pp. 159, 160, 162, 163, 164); FOURNIER (85): from Turonian [!]; LEONHARD (187) p. 40.—*A. semiglobus* Lam. is syn. of *Galeola papillosa* Klein; LAMBERT (180) p. 184.—*A. cf. semiglobus*; FOURNIER (85) pp. 162 & 163.—*A. spatangiformis* F. A. Roem., holotype lost; SCHLUETER (297) p. 23.—*Ananchytes striatus*; FOURNIER (85) p. 164.

Arbacia dufresnii; MEISSNER (228) p. 83.—*A. pustulosa*; MARCHISIO (216) p. 4: asphyxia; UEXKÜLL (331) p. 469.—*A. spatuligera*; MEISSNER (228) p. 84.

†*Arbacina mutellaensis*, Miocene, between Mutella and Cacilhas, Portugal; LORIOL (193), Mem. Direc. Trav. Geol. Portugal, p. 8, pl. i, n. sp.

†*Archæocidaridæ*, defined, includes *Archæocidaris*, *Lepidocidaris*; JACKSON (139) p. 241: incl. *Pholidocidaris*, *Lepidocidaris*, *Archæocidaris*, *Eocidaris*; TORNQUIST (327) pp. 731, 764.

†*Archæocidaris*, rediagnosed, divided in 2 groups of *A. rossica* and *A. urei*; TORNQUIST (327) p. 770.—*A. agassizi*, discussed (p. 213); *A. drydenensis*, discussed (p. 214); JACKSON (189): referred to *Eocidaris*; TORNQUIST (327) pp. 770, 773.—*A. edgarensis*, *A. illinoisensis*, *A. keokuk*, *A. legrandensis*, and *A. mucronata*; JACKSON (139) p. 214.—*A. cf. munsterianus* (pp. 541, 555); *A. nerei* (pp. 540, 555); LEYH (188): redescr. from Domaine des Roches, La Varville, and Siguret; JULIEN (151) p. 126, pl. vi.—*A. rossica* Vern., redescr. with morphological notes (see II B) and figures; TORNQUIST (326): var. nov. *schellwieni*, Upper Carboniferous, Pontafel, Carnatic Alps; TORNQUIST (327) p. 781, pl. xxii.—*A. shumardana* and *A. spiniclavata*; JACKSON (139) p. 214.—*A. urei*; MORTON (245) p. 59: redescr.; TORNQUIST (327) p. 775, pl. xxii: redescr. from l'Ardoisière, Central France, plates figd by Keeping, 1876, not of this genus; JULIEN (151) p. 223, pl. xvi.—*A. wortheni*; TORNQUIST (326) p. 31 footnote: arrangement of plates fully described, and early growth-stages inferred; JACKSON (139) p. 213, pl. viii.—*A.* sp., spines from l'Ardoisière (p. 125, pls. xvi & xvii); *A.* sp. ?, plate and spine from Regny (p. 127, pl. iii); JULIEN (151).

A. griineri, Carboniferous Limestone, l'Ardoisière, Central France; JULIEN (151) p. 125, pl. xvi.—*A. trautscholdi*, based on *A. rossica* Trautsch., 1868, non Verneuil, Carboniferous, Mjatschkowa; TORNQUIST (326), N. Jahrb. Min. 1896, vol. ii, p. 29, pl. iv.—*A. wervekei*, Lower Carboniferous, Hunsrückenwald, Elsass; TORNQUIST (327), Abh. geol. Karte Elsass, v, p. 778, pls. xxi & xxii: n. spp.

†*Archæodiadema*, n. g. with genotype *A. thompsoni*, n. s., *Cerithium* beds or Lower *Leda ovum* beds of Upper Lias, Higham Ferrers, Northants, England; GREGORY (106), Geol. Mag. (n. s. Dec. iv), iii, p. 317; LAMBERT in Review says only subgenus of *Diadematopsis*.

†*Asteropsis*, nom. mut. in *Actinopsis*, q. v.; LAMBERT (179).

Asthenosoma hystrix; KOEHLER (163) p. 472, & (164) p. 90.

A. ijimai, near Misaki, Japan (p. 8, pl. ii); *A. longispinum*, 313–376 fms.,

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Sagami Sea, Japan, (p. 5, pl. ii); YOSHIWARA (352), Annot. zool. Japon. i, n. spp.

Astropyga radiata; PFEFFER (267) p. 46.

Atelostomata, suborder defined, includes families *Cassidulidæ*, *Holasteridæ*, *Spatangidæ*; ZITTEL (356) p. 195.

†*Bolbaster verrucosus*, Senonian of Mekneça, Algeria; REPELIN (279) p. 104.

Bothriocidarida, defined; ZITTEL (356) p. 182; ZITTEL-EASTMAN (357) p. 219.—Place of the Order in the System; JACKSON (139) p. 238.

†*Bothriocidaris*, possibly a Cystid; KOKEN (171) p. 256.—*B. pahleni*, ambulacrals (p. 190), growth discussed (p. 233); JACKSON (139).

†*Botriopygus zumoffeni*, slight variations from type; LORIOL (195) p. 161.

†*Brissopneustes*:—*B. danicus*, Danian of Vixo in Jutland, and other Scandinavian localities (p. 18, pl. i); *B. suecicus*, Faxekalk (Danian) of Annetorp, S.W. of Malmö, Sweden (p. 34, pl. i); SCHLUETER (297), Zeitschr. Deutsch. geol. Ges. xlix: n. spp.

Brissopsis:—†*B. borsonii*, is Pliocene (Placentian) not Miocene (p. 349); †*B.* cf. *B. borsonii*, from Placentian of Mt. Capriolo near Bra in Piedmont (p. 351); BOTTO-MICCA (41).—†*B. bucklandi*, holotype redescr., compared with all other spp. of genus, locality and horizon unknown; SCHLUETER (296) p. 970.—†*B. crescenticus*; MAZZETTI (225) p. 436.—†*B. elegans*, believed to occur in Miocene of Ceva, Piedmont (p. 352); †*B. genei* (p. 345); var. nov. *pliocenica*, Placentian of Monte Capriolo near Bra in Piedmont (p. 346, pl. x); var. nov. *cevensis*, Langhian of Ceva in Piedmont (p. 346); †*B. intermedius* (p. 347); BOTTO-MICCA (41).—*B. lyrifer*; SMITH (314); KOEHLER (163) p. 475, & (164) p. 97; †VINASSA DE REGNY (334) p. 152.—*B. lyriphera* [sic]; †MAZZETTI (225) p. 435.—†*B. ottnangensis*, *op. cit.* p. 436.—†*B. ovatus* Sismonda, emended, comes from Helvetian (p. 348, pl. x); †*B. pecchiolii* (p. 347); †*B. sismondæ* (p. 352); †*B.* cf. *B. sismondæ*, Miocene of Ceva, Piedmont (p. 350); BOTTO-MICCA (41).

†*B. craverii*, with var. *major* (p. 349, pl. x) & †*B. latissimus* (p. 347), Placentian of Monte Capriolo near Bra in Piedmont; BOTTO-MICCA (41), Boll. Soc. geol. Ital. xv.—†*B. lusitanicus*, Miocene, Grillos near Lisbon, allied to *B. borsoni*; LORIOL (193) Mem. Direc. Trav. Geol. Portugal, p. 42, pl. xiii: n. spp.

†*Brissus unicolor*; BELL (33) p. 10.—†*B.* sp.; MAZZETTI (225) p. 436.

†*Caratomus* Agass., 1840, is syn. of *Echinogalerus* Koenig, 1825 (p. 160); *C. avellana* compared with *C. sulcatoradiatus*, and distinguished from *C. dollfusi*, n. s. and *C. peltiformis* (pp. 157 & 158); *C. laubei*, discussed (p. 159); *C. peltiformis*, distinguished from *C. avellana* and *C. dollfusi*, n. s., and discussed, with var. nov. *belgica*, Danian of Ciply (p. 158, pl. iv); *C. sulcatoradiatus*, compared with *C. avellana* (p. 157, pl. v); LAMBERT (180).

†*C. dollfusi*, Cretaceous, Cotentin, based on *C. avellana* d'Orb. and Desor., non Dubois (p. 158); *C. rutoti*, Danian, "poudingue de la Malogne," Ciply (p. 157, pl. iv); LAMBERT (180) Bull. Soc. Belge Geol., ser. 2, xi: n. spp.

†*Cardiaster*:—*C. ananchytis*, internal cast from Chlomeker Schichten figd; FRIČ (91) p. 71.—*C.* (olim *Holaster*) *cordiformis* Morris non Sorignet is syn. of *C. granulosus* Goldf., for Sorignet's sp. v. *C. heberti*; LAMBERT (180) p. 177.—*C. cotteauanus*; FRIČ (91) p. 72.—*C. fossarius* Benett; JUKES-BROWNE (149) p. 107.—*C. granulosus* Goldf.; STOLLEY (320) p. 247: redescr., plastron figd, distinguished from Turonian specimens so called which = *C. cotteaui* d'Orb. (p. 173, pl. iii); *C. heberti*, redescr., incl. *Holaster cordiformis* Sorignet non Morris, derived from *C. æquituberculatus* (of *M. cor-anguinum* zone) by way of *C.* (olim *Stegaster*) *facki* Stolley (of *Bel. quadrata* zone) (p. 176, pl. ii); LAMBERT (180).—*C. orientalis* Stoliczka, fig. 2 non fig. 1, is probably

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Hemipneustes; NOETLING (248) p. 29.—*C. zignoanus* d'Orb., is *Ovulaster*; LAMBERT (178) p. 331.

†*Cardiolampas* Pomel, its relations to *Collyrites*; GAUTHIER (98) p. 21.

†*Cassidulus testudinarius*; GREGORIO (105) p. 110.

†*Catopygus*:—*C. carinatus*; LEONHARD (187) p. 28.—*C. cylindricus*; ALMERA (3) p. 569.—*C. fenestratus*, affinities discussed, apices figured, one abnormal; LAMBERT (180) p. 172.

Centrostephanus rodgersi, New Zealand; FARQUHAR (83) p. 189.

Cidaris:—†*C. attenuata*; RAULIN (274).—†*C. avenionensis*; DEPÉRET (64) p. 522; MAZZETTI (225) p. 417: redescribed from Portugal; LORIOL (193) p. 3, pl. i: Burdigalian and Helvetian; LORIOL (194) p. 118, pl. iv.—†*C. aff. avenionensis*; ALESSANDRI (1) p. 83.—†*C. belgica*; BELL (33) p. 7; MAZZETTI (225) p. 417.—†*C. blumenbachi*; HUG (133) pp. 392, 403; ROMAN (281) p. 329: (Incl. *C. histricoides*, Quenst.), geogr. distrib., found in Posen; GALLINEK (93) p. 403.—†*C. bucciniferа* Caffin, referred to *Macrodiadema*; LAMBERT (180) p. 147.—†*C. cervicalis*, HUG (133) p. 403.—†*C.* cf. *coronata*; FOURNIER (85) pp. 118, 121.—†*C. faujasi*, spines probably belong to *Temnocidaris danica* (p. 145); †*C. forchhammeri*, synonymy discussed; LAMBERT (180) (pp. 143, 190).—†*C. florigemma*; HUG (133) p. 403; SCHLUETER (298) p. 946: Interambulacrals; JACKSON (139) p. 215, pl. viii.—†*C.* cf. *florigemma*; FOURNIER (85) pp. 118, 121.—†*C. glandifera*; KILIAN (157) pp. 678, 680, 682, 685, 686; ROMAN (281) p. 330.—†*C.* cf. *glandifera*; FOURNIER (85) p. 120.—†*C. grandæva*; WAGNER (337) p. 100.—†*C. hardouini*; LAMBERT (180) p. 142.—†*C. heteracantha*; KILIAN (157) p. 733.—†*C. hirta* & †*C. melitensis*; MAZZETTI (225) p. 417.—†*C.* cf. *melitensis* et aff. *C. sabaritensis*; PRATO (271).—†*C. meridanensis*; KILIAN (157) p. 721.—*C. metularia*; PFEFFER (267) p. 45.—†*C. munsteri*, spines redescr., incl. *C. peroni* Cott., Helvetian and Burdigalian; LORIOL (194) p. 119, pl. iv.—†*C. oosteri*, spines discussed; LAMBERT (179) p. 487.—†*C. papillata*; MAZZETTI (225) p. 417.—†*C. parandieri* Ag., made syn. of *C. blumenbachi* Münst.; HUG (133) p. 403.—†*C. peroni* Cott., is distinct from *C. munsteri* Sism.; ALESSANDRI (1) p. 84.—†*C. pilum*; KILIAN (158) p. 894.—*C. psammosa*; SCHLUETER (298) p. 946.—†*C. pseudoserrata* Pavay non Cott., made n. sp. *Cidaris pannoniæ*; LAMBERT (179) p. 486.—†*C. punctatissima*, KILIAN (157) pp. 733, 738.—†*C. rosaria*; ALESSANDRI (1) p. 83: spines, redescr.; VINASSA DE REGNY (334) p. 143.—†*C. serrata*; LAMBERT (180) p. 142, pl. ii.—†*C.* cf. *spinosus*, in Posen; GALLINEK (93) p. 404.—†*C. subularis*, spines found in Eocene of Aude; LAMBERT (179) p. 486, pl. xviii.—†*C. subvesiculosa*; FRIČ (91) p. 71.—†*C. tessurata*; SANGIORGI (288) p. 180.—†*C. tombecki*, redescr.; LAMBERT (180) p. 145, pl. ii.—†*C. transversa*; WAGNER (337) p. 100.—*C. tribuloides*, interambulacrals; JACKSON (139) p. 218, pl. viii.—†*C. verticillum*, "è la specie fossile della vivente *Cidaris verticillata*; Lam. Fu così denominata per distinguerla da essa"; MAZZETTI (225) p. 417.—†*C. vesiculosa*; KILIAN (157) p. 793.—†*C.* sp. *a*, *b*, *c*, *d*, spines, Callovian; PARONA (257) pp. 394 & 395, and figg. 45–47.—†*C.* sp., spine like *C. chalmasi*, from S. Tunis; GAUTHIER (98) p. 16.—†*C.* sp. referred by Peron to *C. distincta* Sorignet; LAMBERT (180) p. 142, pl. ii.—†*C.* sp.; ALESSANDRI (1) p. 84, pl. ii.

†*C. montainvillensis*, Calcaire pisolithique à *Nautilus danicus* de Montainville, also at Meudon and Vigny, in Calcaire grossier of Mons, Upper Chalk of Faxoe, and Chalk of Ciply, based on spines; but subsequently shown to be only a var. of *C. forchhammeri*; LAMBERT (180) Bull. Soc. Belge Geol. ser. 2, xi, pp. 143, 190, pl. ii.—†*C. pannoniæ*, based on *C. pseudoserrata* Pavay non Cotteau, Budapest; LAMBERT (179) Bull. Soc. geol. France, ser. 3, xxv, p. 486.—†*C. pisum*, Bryozoan Crag,

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Aldborough, Suffolk; BELL (133) Rep. Yorksh. Soc. for 1896, p. 7, no fig.—†*C. suleimani*, Maestrichtian, Mari Hills, Baluchistan; NOETLING (248) Pal. Ind. (16) i, pt. 3, p. 11, pl. ii : n. spp.

†*Circopeltis*, defined, place in system, includes *Micropsina* and *Strictechinus*; *C. baicherei* discussed; LAMBERT (179) p. 517.

†*Clypeaster*:—*C. acclivis*, redescr. fr. Portugal; LORIOL (193) p. 18, pl. v.—*C. acuminatus*; FRANZENAU (87) p. 20.—*C. altus*, redescr. fr. Portugal; LORIOL (193) p. 24, pl. x.—*C. altus* Leske, *C. depressus* Sow., *C. gibbosus* Serr., *C. latirostris* Ag., *C. michelottii* Ag., *C. olisiponensis* Mich., *C. placenta* Mich., *C. portentosus* Des-Moul., *C. scillai* Des-Moul., *C. tauricus*, Desor., maintained, all other names applied to this group becoming those of subspp. or else synonyms; MAYER-EYMAR (224).—*C. atlas*, Tortonian, Algeria (p. 181); *C. beringeri*, Tortonian, plain of Chellif, Algeria (pp. 175 & 176); REPELIN (279).—*C.* cf. *breunigii*, described; BONTSCHEFF (40) p. 369.—*C. cinalaphi*, and *C. conoideus*, Tortonian, plain of Chellif, Algeria; REPELIN (279) pp. 175 & 176.—*C. crassicostatus*; ALESSANDRI (1) p. 80: redescr. fr. Portugal, also plaster cast of type figured, synonymy discussed; LORIOL (193) p. 16, pls. iv, v.—*C. curtus*, and *C. decemcostatus*, Tortonian, plain of Chellif, Algeria; REPELIN (279) pp. 175 & 176.—*C. depressus*, vide *C. altus*.—*C. expansus*, *C. aff. expansus et marginatus*, Tortonian, Dra el Khenanis, &c., Algeria; REPELIN (279) pp. 179, 180, 181.—*C. fasciatus*; GREGORIO (105) p. 111.—*C. gibbosus*, vide *C. altus*.—*C.* cf. *guidotti*, Miocene of Vigoleno; VINASSA DE REGNY (334) p. 154.—*C. intermedius*; ALESSANDRI (1) p. 81, pl. ii: Helvetian of Tiaret, Algeria; REPELIN (279) p. 157.—*C.* cf. *laboriei*, Tortonian, Dra el Khenanis, Algeria; REPELIN (279) pp. 179 & 180.—*C. laganoides*, redescr. fr. Portugal; LORIOL (193) p. 33, pl. xi.—*C. latirostris*, ditto; *op. cit.* p. 31: vide et. *C. altus*.—*C. marginatus*, redescr. fr. Portugal; LORIOL (193) p. 34, pl. xi.—*C. michelotti*, ditto; *op. cit.* p. 29, pl. x: vide et. *C. altus*.—*C. cf. ogleianus*, Tortonian, Dra el Khenanis, Algeria; REPELIN (279) pp. 179 & 180.—*C. olisiponensis*, redescr. fr. Portugal; LORIOL (193) p. 22, pl. viii: vide et. *C. altus*.—*C. parvituberculatus*, Tortonian, plain of Chellif, Algeria; REPELIN (279) pp. 175 & 176.—*C. placenta* and *C. portentosus*, vide *C. altus*.—*C. productus*, Tortonian of Dir el Kebir, Algeria (p. 172), plain of Chellif (p. 175 & 176); var. *tigaudensis*, Tortonian, Algeria (p. 181); *C. punctalatus*, Tortonian, plain of Chellif, Algeria (pp. 175 & 176); REPELIN (279).—*C. reidi*; FRANZENAU (87) p. 20.—*C. scillae*, vide *C. altus*.—*C. subacutus* (pp. 175 & 176), and *C. subconicus* (pp. 175, 176, 181), Tortonian, plain of Chellif, &c., Algeria; *C.* cf. *suboblongus*, Tortonian, Dra el Khenanis, Algeria (pp. 179 & 180); REPELIN (279).—*C. tauricus*, redescr. fr. Portugal; LORIOL (193) p. 28: vide et. *C. altus*.

C. delgadoi, Miocene, Marvilla, near Lisbon; LORIOL (193) Mem. Direc. Trav. Geol. Portugal, p. 26, pl. ix.—*C. guidottii*, Pliocene, Castellarquato; VINASSA DE REGNY (335) Atti Soc. Toscana, xv, p. 150 and fig.—*C. mutellensis*, Miocene, Mutella, Portugal (p. 21, pl. vii); *C. palencaensis*, Miocene, Fornodo Tijolo (Palença) and Portinho d'Arrabida, Portugal (p. 19, pl. vi); LORIOL (193) Mem. Direc. Trav. Geol. Portugal: n. spp.

†*Clypeolampas*:—*C. helios* (p. 24, pl. v), and *C. vishnu* (p. 25, pl. iv), Maestrichtian, Mari Hills, Baluchistan; NOETLING (248) Pal. Ind. (16) i, pt. 3: n. spp.

†*Codiopsis doma*, Cenomanian of Devon; JUKES-BROWNE & HILL (150) p. 143.

†*Collyrites*, the genus discussed; GAUTHIER (98) p. 21.—*C. analis* not Callovian; PARONA & BONARELLI (259) p. 82.—*C. bicordata*; HUG

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(133) p. 392.—*C. carinata*; KILIAN (157) p. 679.—*C. elliptica*; PARONA & BONARELLI (259) p. 81.—*C. friburgensis*, Oxfordian, Tunis; GAUTHIER (98) p. 20, pl. XXXII.—*C. malbosi*; KILIAN (157) p. 678.—*C. oblonga*; ALMERA (3) p. 568.—*C. ovalis* not Callovian (p. 82); *C. pseudoringens* (p. 81); PARONA & BONARELLI (259).—*C. subelongatus* referred to *Disaster*; LAMBERT in KILIAN & LEENHARDT (159) p. 974.

C., Neocomian of Palud-de-Moustiers (Basses-Alpes); LAMBERT in KILIAN & LEENHARDT (159) p. 973, n. sp. sine nom.

Collyropsis, a link between *Collyrites* and *Ananchytidæ*; GAUTHIER (98) p. 22.

†*Conoclypeus*:—*C. anacoreta* (p. 442), *C. bordae* (p. 443); MAZZETTI (225).—*C. conoideus*; FOURNIER (85) p. 179; POPOVICI-HATZEG (270) p. 248.—*C. depressus* (p. 443), *C. duboisii* (p. 442), *C. montesiensis* (p. 443), *C. ovum* (p. 443), *C. plagiosomus* (p. 442); MAZZETTI (225).—*C. rostratus*; PRITCHARD (272) p. 143.—*C. semiglobus* (p. 442), *C. subcylindricus* (p. 442); MAZZETTI (225).

†*Coptosoma*, incl. *Glyptocidaris*, place in system (p. 498); *C. atacicum* should be *C. blanggianum* Desor. (p. 504); *C. crenulare* (olim *Glyptocidaris*), apex figured (p. 510); *C. monzense* discussed (p. 505); *C. pellati* discussed (p. 505); *C. rousselli* closely allied to *C. pentagonale* (p. 505); LAMBERT (179).

C. granulare, Eocene, Trabet de Montolieu (Aude) (p. 506, pl. xviii); *C. marticense*, for *Cyphosoma schlumbergeri* Cotteau, from Cretaceous of Martigues (p. 503); LAMBERT (179) Bull. Soc. geol. France, ser. 3, XXV: n. spp.

†*Coraster meunieri*; FOURNIER (85) pp. 161, 163.

†*Cosmocyphus*, syn. of *Cyphosoma*; LAMBERT (179) p. 499.

Cyclaster discussed; SCHLUETER (297) p. 25.—†*C. archeri*, with synonymy; PRITCHARD (272) p. 144.

†*Cyclolampas voltzi* or *verneuili*, Oxfordian, Tunis, compared with specimens from Ardèche and Var; GAUTHIER (98) p. 19.

†*Cystocidaroida*, diagnosis of Order; GREGORY (109) p. 133; ZITTEL (356) p. 182; ZITTEL-EASTMAN (357) p. 219.

†*Cyphosoma*, incl. *Phymosoma* & *Koenigia*; LAMBERT (179) p. 499.—*C. ameliæ* is very distinct from *Micropsis* and *Micropsidia*; ARNAUD (14) p. 239.—*C. arnaudi* Cott., referred to *Asteropsis* (p. 497); *C. aublini* referred to *Thylechinus* (p. 503); *C. blanggianum* de Loriol non Desor., referred to *Thylechinus* (p. 503), but Desor sp. referred to *Coptosoma* (p. 504); *C. bonissenti* Cott., referred to *Rachiosoma* (p. 497); LAMBERT (179).—*C. corneti*; LAMBERT (180) p. 154.—*C. croizieri* Cott., referred to *Thylechinus* (p. 497); *C. llorœ*, Cott., referred to *Actinopsis* (*Heteractis*) (pp. 500, 508); LAMBERT (179).—*C. paucituberculatum*; KILIAN (157) p. 733.—*C. pulchellum* referred to *Thylechinus* (p. 504); *C. raritubercultatum* Cott., referred to *Coptosoma* (p. 497); LAMBERT (179).—*C. schlumbergeri* Cott., Turonian of Algeria, referred to *Thylechinus*, but the one from Martigues is a *Coptosoma*, *C. marticense*, n. sp. (p. 503); LAMBERT (179).—*C. schlumbergeri* and *C. verneuili*, not referable to *Micropsidia*; ARNAUD (14) p. 238.—*C. superbum*, probably a *Thylechinus*; LAMBERT (179) p. 503.—*C.* sp., Maestrichtian, Mari Hills, Baluchistan; NOETLING (248) p. 13.

C. inops, based on a spine, and *C. rutoti*, both Senonian, phosphatic chalk of Ciply; LAMBERT (180) Bull. Soc. Belge Geol. ser. 2, xi, p. 155, pl. iv: n. spp.

Diadema setosum; DUERDEN (77) p. 284: colour; PFEFFER (267) p. 45.—†*D.* sp.; BELL (33) p. 7.

†*D. megastoma*, Middle Crag, probably derived from Diestian, Waldringfield; BELL (33) Rep. Yorksh. Soc. for 1896, p. 7, no fig., n. sp.

Diademides (= *Glyphostomata*), scheme of classification; LAMBERT (179) p. 511.

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†*Diplopodia*:—*D. hermonensis*, added details; LORIOL (195) p. 150, pl. vi. —*D.* (*Pseudodiadema*) *variolare*; PERON (261) p. 298: fr. Lebanon; LORIOL (195) p. 151, pl. vi: var. *roissyi*, redescribed, connected with *D. zumoffeni*; LORIOL (195) p. 152, pl. vi.

D. blankenhorni, Cenomanian, Wady Salima, nr. Douar, Valley of the Nahr el Kelb, nr. Beit-Chebab, and Bikfaya (outside the village), Lebanon; LORIOL (195) Rev. Suisse Zool. v, p. 149, pl. vi, n. sp.

Diploporus, syn. of *Salmacis*; LAMBERT (179) p. 497.

†*Disaster*, etymology, non *Dysaster*; LAMBERT in KILIAN & LEENHARDT (159) p. 974.—*D.*, cf. *analis*; FOURNIER (85) p. 115.—*D. anasteroides*; KILIAN (157) pp. 733 & 734.—*D. granulosus*; HUG (133) p. 404.—*D. ovalis* not Callovian; PARONA & BONARELLI (259) p. 82.—*D. subelongatus*; KILIAN (157) pp. 721, 734; KILIAN & LEENHARDT (159) pp. 974, 976.

†*Discoidea*:—*D. concava*?; FOURNIER (85) p. 117.—*D. conica*; KILIAN (157) p. 797, & (158) p. 894; PARONA & BONARELLI (258) p. 64.—*D. cylindrica*; *op. cit.* p. 65.—*D. decorata*; ALMERA (3) p. 568.—*D. maxima*; FOURNIER (85) p. 159.—*D. rotula*; KILIAN (158) p. 894.—*D. subuculus*; FOURNIER (85) pp. 134, 141, 157, 159, 161.

†*Ditremaster* (?) sp.; HAGMANN (119).

Dorocidaris:—†*D.* cf. *bartletti*, spine fr. Pliocene of Parma & †*D.* cf. *blakei*, plates and spines fr. Pliocene (Tortonian) of Parma district (p. 146); *D. papillata*, spines, redescr. from Neogene of Parma district, incl. *Cidaris schwabenaui* Laube, and probably *C. signata* and *C. margaritifera* Menegh. (p. 144); †VINASSA DE REGNY (334).—*D. papillata*; KOEHLER (163) p. 472, & (164) p. 89: action of Stewart's organs, asphyxiation; UEXKÜLL (331) p. 468.—†*D.* sp.; VINASSA DE REGNY (334) p. 146.

†*Duncaniaster*, n. g., with genotype *D. australiæ* (olim *Holaster*), Duncan; LAMBERT (178) Bull. Soc. geol. France, ser. 3, xxiv, p. 317, footnote.

Dysaster, vide *Disaster*.

†*Echinanthus*:—*E. angulatus*; MAZZETTI (225) p. 437.—*E. aremoricus*, redescr. fr. Portugal; LORIOL (193) p. 41, pl. xii.—*E. marginatus*; MAZZETTI (225) p. 437.

E. griesbachi, Maestrichtian, Mari Hills, Baluchistan; NOETLING (248) Pal. Ind. (16) i, pt. 3, p. 22, pls. iv & v, n. sp.

Echinarachnius:—†*E. juliensis*, Des., Patagonian formation, San Julian; IHERING (136) p. 336.—*E. parma*; HONEYMAN (131) p. 256.

Echinaster sepositus, var. nov. *mediterraneus*, G. of Rapallo, 1 metre; MARCHISIO (216) p. 2.—*E. spinosus*, off Japan; ANON. (12).

Echinobrissidæ include *Echinobrissiens*, *Archiaciens*, *Pygauliens*, *Clypeens*, *Catopygiens* and *Pyguriens*; LAMBERT (180) p. 167.

†*Echinobrissus*:—*E. bourgeoisi* is a *Nucleopygus*, perhaps=*N. minimus*; LAMBERT (180) p. 170.

E. ghazirensis, Cenomanian, below Ghazir, Lebanon; LORIOL (195) Rev. Suisse Zool. v, p. 161, pl. vii, n. sp.

Echinocardium australe, local var., Wellington, N.Z.; FARQUHAR (83) p. 187.—*E. cordatum*; ROBERTSON (280); †BELL (33) p. 11: and its Gregarine parasite; LÉGER (185).—*E. flavescens*; KOEHLER (163) p. 475 and (164) p. 97.

†*Echinoconus*:—*E. castanea*; KILIAN (158) p. 894; PARONA & BONARELLI (258) p. 65.—*E. conicus*; FOURNIER (85) p. 164; STOLLEY (320) p. 272: Lam. (="*albogalerus*" Strombeck); STOLLEY (319) p. 144.—*E. gigas*, apparently differing from the norm in ambulacral pores, Maestrichtian, Mari Hills, Baluchistan; NOETLING (248) p. 17, pl. iii.—*E. roemeri*; STOLLEY (320) p. 272.—*E. subconicus*; FOURNIER (85) p. 164.

†*Echinocorys*, vide sub *Ananchytes*. Geological history and mutations;

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LAMBERT (180) p. 178.—*E. arnaudi* discussed, incl. *E. regularis* Arnaud nom. nud.; LAMBERT (180) p. 184.—*E. sulcatus*; STOLLEY (320) p. 256.—*E. vulgaris*, var. *conica*; STOLLEY (320) pp. 247, 272: described, distinguished from a var. nov. *subconica*, of Senonian; LAMBERT (180) p. 182: var. *gibba*, Rathsbruche, Luneburg (p. 143), varr. *conica*, *rotunda* (p. 147); STOLLEY (319): var. *ovata*; STOLLEY (320) p. 247: defined and described, includes var. *limbata*, its origin, it gives rise to a subvar. *ciplyensis*; LAMBERT (180) p. 181, pl. v.

E. belgicus, Danian, Ciply; LAMBERT (180) Bull. Soc. Belge Geol. ser. 2, xi, p. 183, pl. iv.—*E. duchesnei*, Cretaceous, ? Senonian, Ambohimarina, near Diégo-Suarez, Madagascar, allied to *E. beaumonti*; LAMBERT (178) Bull. Soc. geol. France, ser. 3, xxiv, p. 329.—*E. pyramidalis*, Danian of Bedat, quoted from Arnaud MS.; LAMBERT (180) Bull. Soc. Belge Geol. ser. 2, xi, p. 183, pl. iv: n. spp.

Echinocyamus:—†*E. forbesi*, †*E. hispidulus*, and †*E. oviformis*; BELL (33) p. 10.—†*E. piriformis*; RAULIN (274); ALESSANDRI (1) p. 79, pl. ii.—*E. pusillus*; MARCHISIO (216) p. 4; †BELL (33) p. 9: Pliocene, Mte Mario; †MELI (231) p. 149: incl. *E. transylvanicus*, Laube; †VINASSA DE REGNY (334) p. 149.—†*E. umbonatus*, redescribed, from Upper Burdigalian; LORIOL (194) p. 116, pl. iv.

Echinocyphus, incl. *Zeuglopleurus*, place in system; LAMBERT (179) p. 495.—†*E. difficilis*; SHARMAN & NEWTON (306) p. 254.

†*Echinocystidæ*, diagnosis; GREGORY (109) p. 133.

†*Echinocystis* Wyv.-Thoms., discussed; JACKSON (139) p. 242.—*E. pomum*, structure fully described, affinities discussed; GREGORY (109) p. 124.

†*Echinogalerus* Koenig, with type *E. peltiformis* Wahlenb., is prior to *Caratomus* d'Orb.; LAMBERT (180) p. 160.

†*Echinolampas*:—*E. affinis*; ALESSANDRI (1) p. 78; MAZZETTI (225) p. 438.—*E. algirus*; BRIVE (45) p. 597.—*E. angulatus*; ALESSANDRI (1) p. 77, pl. ii; MAZZETTI (225) p. 438.—*E. beaumonti* and *E. blainvillei*; MAZZETTI (225) p. 441.—*E. calarensis*; ALESSANDRI (1) p. 76.—*E. dinanensis* var. nov. *gahardensis*, Miocene, Brittany; SEUNES (305).—*E. conicus* (p. 440), *E. depressus* (p. 437), *E. discus*? (p. 440), *E. ellipticus* (p. 439), *E. escheri*? (p. 438), *E. eurysomus* (p. 438), *E. globulus* (p. 438), *E. hemipilus* (p. 441); MAZZETTI (225).—†*E. hemisphæricus*; ALESSANDRI (1) p. 74; MAZZETTI (225) p. 440; VINASSA DE REGNY (334) p. 152: including *E. linki* Goldf., and *E. semiglobus* Grasel.; MELI (230) p. 164: redescr. including *E. linki*, Goldf. (p. 37, pl. xi), with var. nov. *maxima*, Miocene, numerous localities, Portugal (p. 40, pl. xii); LORIOL (193).—*E. insignis*, Tortonian, plain of Chellif, Algeria; REPELIN (279) p. 175.—*E. kleini* (p. 439); *E. magnificus* Mazz., 1888, Miocene, Montese [possibly intended as n. sp.] (p. 441); *E. patellaris* (p. 440); MAZZETTI (225).—*E. pilus*; ALESSANDRI (1) p. 76; MAZZETTI (225) p. 441.—*E. plagiosomus*; ALESSANDRI (1) p. 75.—*E. pomeli*, Tortonian, plain of Chellif, Algeria; REPELIN (279) p. 175.—*E. productus* (p. 439), *E. rostratus* (p. 439), *E. scutiformis* (p. 440), *E. similis* (p. 438), *E. sphæricus* (p. 440), *E. stelliferus* (p. 442), *E. studeri*? (p. 440), *E. subangulatus* (p. 438), *E. subcylindricus* (p. 438), *E. subellipticus* (p. 439), *E. subquadrangulatus* (p. 439); MAZZETTI (225).—*E. subrostratus*, probably Belgian Miocene, not British; BELL (33) p. 10.—*E. sulcatum*, Lower Eocene of Djebel Coubarnas, Algeria; REPELIN (279) p. 121.

E. soyei, Miocene, Brittany; SEUNES (305).—*E. zlatarskii*, volcanic tuff, Eocene, above Kavak-Mahle near Haskovo, Bulgaria; BONTSCHEFF (40) Jahrb. geol. Reichsanst. xlvi, p. 369, pl. iv: n. spp.

Echinometra lucunter; WHITELEGGE (346) p. 156: Kermadec Is.; FARQUHAR (83) p. 188: colour of spines; PFEFFER (267) p. 46.—*E. oblonga*, Funafuti; WHITELEGGE (346) p. 156.

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Echinometridæ, classificatory characters discussed (p. 487), divided into Oligoporous genera (*Salmacinæ*) (p. 494) and Polyporous (*Cyphosominæ*) (p. 498); LAMBERT (179).

†*Echinopsis nattheimensis* may be *Archæodiadema*; GREGORY (106) p. 319.

†*Echinospatagus*:—*E. collegnoi*; ALMERA (3) pp. 567 & 568; KILIAN (157) pp. 753, 754, 756: vide *Toxaster*.—*E. cordiformis*, referred to *Toxaster retusus*; LAMBERT in KILIAN (157) p. 736.

Echinothrix calamaris, colour; PFEFFER (267) p. 45.—*E. turcarum*, colour of spines; PFEFFER (267) p. 45: colour and measurements, Funafuti; WHITELEGGE (346) p. 155.

†*Echinothuridæ*, affinities with *Pedinidæ*; GREGORY (108): compared with *Perischoechinidæ*; TORNQUIST (326) p. 59.

Echinus acutus; KOEHLER (163) p. 473, & (164) p. 92.—*E. alexandri*, first found in Bay of Biscay, 1710 m., variations from type described; KOEHLER (163) p. 473, & (164) p. 92, figg. 4, 18, 19.—*E. angulosus*; WHITELEGGE (346) p. 156.—*E. elegans*; KOEHLER (163) p. 473, & (164) p. 92.—*E. esculentus*; DAHL (62) p. 172; †BELL (33) p. 8: parasitic copepod; SCOTT (300): activities of amœbocytes; THÉEL (325) p. 50.—*E. hungaricus* Laube, specimen causing reference of *E. dux* to this species; VINASSA DE REGNY (334) p. 147: probably an *Anapesus*; LAMBERT in Review of VINASSA DE REGNY (334).—†*E. lusseri*, referred to *Triplacidia*; LAMBERT (179) p. 504.—†*E. lyelli*; BELL (33) p. 8.—*E. magellanicus*; MEISSNER (228) p. 87.—*E. microtuberculatus*; MARCHISIO.(216) p. 4: pluteus; SEELIGER (304): irritability of mesenchyme cells; DRIESCH (75): cleavage under compression; ZIEGLER (354) p. 67: movements of larvæ; ZIEGLER (355) p. 143: mitosis; LAUTENBACH (183) and HERTWIG (128).—*E. miliaris*; †BELL (33) p. 8: stereom formation by special amœbocytes; THÉEL (325) p. 55.—†*E. nortoni* A. Bell, is syn. of *Psammechinus sphæroideus* Cott. (p. 8); †*E. norvegicus* and †*E. paucimiliaris* (p. 9); BELL (33).—*E. sphæra*; KOEHLER (163) p. 475 & (164) p. 97.—†*E. woodi* and †*E. woodwardi*; BELL (33) p. 8.

†*Enallaster*:—*E. delgadoi*, from Lebanon; LORIOL (195) p. 165.—*E.* (*Toxaster*) *scoticus*, is nearly allied to *E. granosus*; SHARMAN & NEWTON (306) p. 254.—*E. syriacus*, variation from type; LORIOL (195) p. 164.

Encope:—†*E. chilensis*, Philippi, is from Pliocene of Central America; IHERING (136): is it *Encope*, *Mellita*, or *Monophora*? LAHILLE (176) (p. 437).—*E. emarginata*, specimen with only 2 genital pores (p. 435); *E. grandis* from C. Frio, Brasil, or is it *E. emarginata* convergent with *E. grandis*? (p. 436); *E. michelini* closely related to *E. emarginata*, also to *Monophora darwini* (p. 434); LAHILLE (176).

†*Eocidaris*, rehabilitated; TORNQUIST (327) p. 772: compared with *Archæocidaris*, maintained, including *E. drydenensis*, *E. scrobiculata*, and *E. verneuilana*; TORNQUIST (326) p. 38.

E. (?) *acuaria*, Pilton Beds, Devonshire; WHIDBORNE (342) P. Geol. Assoc. xiv, p. 376, no fig., n. sp.

†*Epiaster*:—*E. distinctus*; ALMERA (3) p. 569.—*E. gibbus*; STOLLEY (320) p. 272.—*E. trigonalis*; PARONA & BONARELLI (258) p. 66.

Euechinoidea, sub-cl. defined, includes orders *Regulares* and *Irregulares*; ZITTEL (356) p. 185: Revised according to Duncan; ZITTEL-EASTMAN (357) p. 223.

†*Eupatangus*:—*E. elongatus*, *E. lateralis*, *E. minimus*, *E. navicella*, *E. ornatus*; BOTTO-MICCA (41) pp. 367 & 368.

E. cairensis, Eocene, Ouadi-el-Tih, nr. Cairo, incl. *E. formosus* Loriol, pars; LORIOL (196) Mem. Soc. Geneve, xxxii, p. 4, pl. i, n. sp.

Evechinus raritubercularus Bell, is syn. of *E. chloroticus*, specimen measured, spicules of tube-feet figd.; FARQUHAR (83) p. 188.

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†*Fibularia*, 5 spp. recognised, the views of Lambert as to interchange of name with *Echinocyamus* combated; Loriol (196) p. 8.—*F. lorioli*, Egypt, compared with *F. subglobosa*; Loriol (196) p. 6, pl. i.

†*Gagaria*, syn. of *Thylechinus* (p. 496), *G. atacica* referred to *Thylechinus* (p. 500), *G. biarritzensis*, *G. gauthieri*, and *G. pegoti*, referred to *Micropsidia* (p. 500); Lambert (179).

†*Galerites*:—*G. albo-galerus*; Fournier (85) pp. 161, 164.—*G. castanea*; Sharman & Newton (306) p. 252.

†*Gauthieria*, place in system; Lambert (179) p. 498: apex compared with *Rachiosoma* and *Acrosalenia*; Lambert in Fortin (84).—*G. radiata* (olim *Cyphosoma*) Sorignet; Leonhard (187) p. 40: apex figured; Lambert (179) p. 510: its geol. and geogr. distrib., distinguished from *G. broecki*; Lambert (180) p. 152: var. *granulosa*, maintained as var., Senonian, Elbeuf; Lambert in Fortin (84): figures really ×2 not ×4; Lambert in abstract.

G. broecki, Cretaceous, Danian, "Poudingue de la Malogne," Ciply, a descendant of *G. radiata* with which it was confused by Cotteau; Lambert (180) Bull. Soc. Belge Geol. ser. 2, xi, p. 152, pl. iv, n. sp.

Glyphopneustes, incl. *Coptophyma*, place in system; Lambert (179) p. 494.

Glyphostomata, sub-order defined, includes families *Salenidæ*, *Diadematidæ*, *Echinidæ*; Zittel (356) p. 187.

†*Glypticus hieroglyphicus*; Hug (133) p. 404: lower Coralline Oolite near Völksen in Posen; Gallinek (93) p. 404.

†*Glyptocidaris*, syn. of *Coptosoma*; Lambert (179) p. 499.

†*Glyptocyphus*, place in system; Lambert (179) p. 498.

Gnathostomata, sub-order defined, includes families *Echinoconidæ*, *Conoclypeidæ*, *Clypeastridæ*; Zittel (356) p. 191.

†*Gomphechinus*, redefined, place in system; Lambert (179) p. 516.

Goniocidaris, growth discussed; Jackson (139) p. 234.

†*Goniophorus* sp.? "very aberrant variety of *G. lunulatus*," Chloritic Marl, loc. not given; Jukes-Browne & Hill (150) p. 143.

†*Guettaria rocardi*, redescr. with additions to Cotteau's diagnosis, compared with *G. angladei*, apex and plastron figd; Lambert (178) p. 314, pl. x.

Helikodiadema, n. g., with genotype *H. fragile* Wiltshire (olim *Pseudodiadema* [jam *Palæodiadema* Pomel]); Gregory (108) Quart. J. Geol. Soc. liii, p. 121.

Hemiaster:—†*H. acuminatus*; Mazzetti (225) p. 427.—†*H.* cf. *batnensis*; Peron (261) p. 298.—†*H. bufo* not in England; Jukes-Browne & Hill (150) p. 143.—†*H. bufo*? and †*H. buklandi*? [sic]; Mazzetti (225) p. 428.—*H. cavernosus*; Meissner (228) p. 87.—†*H. cotteaui* (p. 428), †*H. declivus* (p. 427); Mazzetti (225).—*H.* (*Tripylus*) *excavatus*; Meissner (228) p. 89.—†*H. gibbus* (p. 426), †*H. hemiglobus* (p. 427); Mazzetti (225).—†*H. major*; Vinassa de Regny (334) p. 153.—†*H. morrisi* is true name of "Spatangus bufo" C. J. A. Meÿer, 1874; Jukes-Browne & Hill (150) p. 144.—†*H. pullus*, from *Trigonoarca* beds, Pondicherri; Kossmat (172) p. 95, pl. x.—†*H. regulusanus*; Frič (91) p. 71.—†*H. rostratus* (p. 426), †*H. semirostratus* (p. 427); Mazzetti (225).—†*H. sublacunosus*; Fric (91) p. 71.—†*H. truncatus* (p. 427), †*H. varus* (p. 426); Mazzetti (225).

†*H. blanfordi*, Mæstrichtian, Mari Hills, Baluchistan; Noetling (248) Pal. Ind. (16) i, pt. 3, p. 35, pl. viii.—†*H. ibelensis*, Cenomanian or Turonian, Ain Ibel, Galilee; Loriol (195) Rev. Suisse Zool. v, p. 170, pl. vii.—†*H. kfourensis*, Cenomanian or Turonian, Kfour, Lebanon, allied to *H. tumidosus*; *op. cit.* p. 172, pl. viii.—†*H. mæstrichtensis* based on "*Micraster leskei*" of Bosquet, which is redescribed; Schlueter (297) Zeitschr. deutsch. geol. Ges. xlix, p. 32, footnote, pl. ii.—†*H. oldhami*, Mæstrichtian, Mari Hills, Baluchistan; Noetling (248) Pal. Ind. (16) i, pt. 3, p. 36, pl. viii.—†*H. tamulicus*, *Trigonoarca*

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beds, ¼ mile W. of Rautankupam, Pondicherri; KOSSMAT (172) Rec. Geol. Surv. India, xxx, p. 96, pl. v, fig. 5 : n. spp.

†*Hemicidaris*:—*H. crenularis*; FOURNIER (85) pp. 101, 113, 118, 121.—*H. crenularis*?, *H. intermedia*, and *H.* cf. *lestoquii*; HUG (133) p. 403.—*H. mespilum* referred to *Rhabdocidaris*; LAMBERT (179) p. 484.

H. ghazirensis, Cenomanian, perhaps Senonian, Ghasir (outside the village) Lebanon, Syria; LORIOL (195) Rev. Suisse Zool. v, p. 147, pl. vi.—*H. zeguellensis*, *Pteroceras* bed, near Tlalet, E.S.E. of Bir Zeguellem, S. Tunis; GAUTHIER (98) pp. 9, 16, pl. xxxii : n. spp.

†*Hemipatagus cordiformis* and †*H. grignonensis*; MAZZETTI (225) p. 437.

†*Hemipneustes*, redescribed, discussed and maintained, its six known species compared; NOETLING (248) p. 26.—*H. italicus*; ANGELIS D'OSSAT & LUZJ (9) p. 66; MAZZETTI (225) p. 436.—*H. leymerici* (p. 32, pl. vii) and *H. pyrenaicus* (p. 29, pls. vi & vii), Maestrichtian, Mari Hills, Baluchistan; NOETLING (248).

H. compressus, Maestrichtian, Mari Hills, Baluchistan; NOETLING (248) Pal. Ind. (16) i, pt. 3, p. 34, pl. vii, n. sp.

†*Hemithylus*, n. g., with genotype *H. rejaudryi* Cotteau (olim *Thylechinus*); ARNAUD (14) Act. Soc. Bordeaux, xlviii, p. 236: perhaps only young of *Rachiosoma*; LAMBERT (179) p. 498.

†*Heteractis*, subgenus nov. of *Actinopsis*, for *A. heteroporus* (q.v.) and *Cyphosoma llorœ* Cott.; LAMBERT (179) pp. 500, 509.

†*Heteraster*:—*H. couloni*; KILIAN (157) p. 761.—*H. oblongus*; ALMERA (3) pp. 567–571.

†*Heterobrissus montesii*; MAZZETTI (225) p. 436.

Heterocentrotus mamillatus; WHITELEGGE (346) p. 156.—*H. trigonarius*; PFEFFER (267) p. 46.

†*Heteroclypeus semiglobus*, redescr. fr. Portugal; LORIOL (193) p. 36.

Hipponoe variegata; PFEFFER (267) p. 46.—†*H. Parkinsoni* var. nov. *gahardensis*, Miocene, Brittany; SEUNES (305).

†*Holaster*:—*H. bouilleti*; FOURNIER (85) p. 164.—*H. lævis* (p. 796), *H. lardyi* (p. 721); KILIAN (157).—*H. peresi*; KILIAN (157) p. 796; PARONA & BONARELLI (258) p. 65.—*H. planus*, including *H. subglobosus*; LEONHARD (187) p. 41.—*H.* cf. *subglobosus*; FOURNIER (85) pp. 157, 163.—*H. suborbicularis* as figd. by Wright in Pal. Soc. Monogr. probably not same as figd. by d'Orbigny in Pal. franc.; JUKES-BROWNE & HILL (150).—*H.* sp., Cenomanian, Devon; *op. cit.* p. 144.

H. syriacus, Cenomanian or Turonian, Kfour, Lebanon; LORIOL (195) Rev. Suisse Zool. v, p. 163, pl. vii, n. sp.

†*Holectypus*:—*H. cenomanensis*, from Lebanon, incl. *H. serialis* Lartet; LORIOL (195) p. 155.—*H. corallinus*, near Bir Zeguellem, S. Tunis; GAUTHIER (98) p. 8, pl. xxxii.—*H. crassus*; PERON (261) p. 298.—*H. depressus*; FOURNIER (85) p. 117: (including *H. ormoisianus* Favre non Cotteau); PARONA & BONARELLI (259) p. 80.—*H. excisus*, from Lebanon (p. 156, pl. vi), *H. larteti* (p. 157, pl. vi); LORIOL (195).—*H. neocomiensis* (p. 721), *H. orificiatus* (p. 679); KILIAN (157).—*H. punctulatus*; PARONA & BONARELLI (259) p. 80.

H. baluchistanensis, Maestrichtian, Mari Hills, Baluchistan; NOETLING (248) Pal. Ind. (16) i, pt. 3, p. 18, pl. iii, n. sp.

Holostomata, suborder defined, includes families *Cidaridæ*, *Echinothuridæ*; ZITTEL (356) p. 185.

†*Hybochinus*, type of n. fam.; TORNQUIST (171); Abh. geol. Karte Elsass, v, p. 732.

†*Hypechinus patagonicus* Des. (= *Echinus patagonensis* d'Orb.), San Julian, Patagonia; IHERING (136) p. 336.

†*Hypsoclypeus doma*, Burdigalian of Algeria; REPELIN (279) pp. 135, 151.

†*Hypsospatangus*:—*H. marmoræ* (olim *Macropneustes*); BOTTO-MICCA (41)

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p. 366.—*H. meneghini*, fresh characters described, and two varieties, *complanatus* and *convexus*, distinguished; BONTSCHEFF (40) p. 372.

†*Infulaster*:—*I. excentricus*, Lüneburg; STOLLEY (319) p. 175.

I. boulei, Cretaceous, ? Senonian, near Diégo-Suarez, Madagascar; LAMBERT (178) Bull. Soc. geol. France, ser. 3, xxiv, p. 331, pl. xiii, n. sp.

Iraniaster, plastron discussed; LAMBERT (178) p. 324.

Irregulares, order defined, includes sub-orders *Gnathostomata*, *Atelostomata*; ZITTEL (356) p. 191.

†*Isopneustes*, discussed; SCHLUETER (297) p. 23.

†*Jeronia*, compared with *Lampadaster*; LAMBERT (178) p. 316.

†*Kœnigia*, syn. of *Cyphosoma*; LAMBERT (178) p. 499.

†*Koninckocidaris* Dollo and Buisseret, is syn. of *Perischodomus*; TORNQUIST (171) p. 725, footnote.

Laganum depressum, Funafuti; WHITELEGGE (346) p. 156.

†*Lampadocorys*, related to *Lampadaster*, its genotype "*Holaster sulcatus*" is from Cenomanian of Rioufroid, near Lus (Drôme); LAMBERT (178) p. 316.

†*Lampadaster*, rediagnosed, affinities discussed (p. 316); *L. grandidieri*, redescribed, apex figured (p. 317); LAMBERT (178) pls. x and xiii.

L. gauthieri, Cretaceous, ? Senonian, near Diégo-Suarez, Madagascar, apex and plastron figured; LAMBERT (178) Bull. Soc. geol. France, ser. 3, xxiv, p. 319, pl. xi: n. sp.

†*Leiosoma* Cotteau non Brandt, nom. mut. in *Trochalosoma* (p. 515); *L. archiaci*, made type of n. g. *Pseudarbacia* (p. 515); *L. babeaui*, probably *Phymechinus* (p. 516); *L. bahezrei*, referred to *Gomphechinus* (p. 516); *L. jauberti* Cott., referred to *Phymechinus* (p. 516); LAMBERT (179).

†*Leiosominæ*, sub. fam. of *Echinometridæ* [should be *Trochalosominæ*]; LAMBERT (179) p. 515.

†*Lepidechinus*, structure and development discussed on evidence of *L. imbricatus* and *L. rarispinus* (p. 226, pl. vii): compared with *Perischodomus* (p. 241); JACKSON (139).

†*Lepidesthes*, alone in family; TORNQUIST (327) p. 732.—*L. colletti* (pp. 200, 210), *L. coreyi* (p. 209), and *L. formosus* (p. 210), discussed; JACKSON (139).

L. (?) *devonicans*, Pilton Beds, Devonshire; WHIDBORNE (342) P. Geol. Ass. xiv, p. 376, no fig.—*L. wortheni*, Keokuk group, Indiana, arrangement of plates fully described, distinguished from *L. formosus* Miller; JACKSON (139) p. 207, pl. ix: n. spp.

Lepidesthidæ, n. fam., distinguished from *Lepidocentridæ*, including *Lepidesthes* and *Pholidocidaris*; JACKSON (139) pp. 206, 241.

†*Lepidocentridæ*, defined; JACKSON (139) pp. 222, 242: defined, includes *Lepidocentrus*, and discussed; TORNQUIST (327) p. 783.

†*Lepidocentrus*:—*L. eifelianus*, discussed (pp. 224 & 225); *L. müllerí*, ambulacrals and interambulacrals described (p. 223); *L. rhenanus*, discussed (p. 224); JACKSON (139).

†*Lepidocidaris*, discussed; TORNQUIST (327) p. 773.—*L. squamosus*, arrangement of plates fully described, genus maintained; JACKSON (138) p. 220.

Leptechinus Gauth., incl. *Peronia*, place in system; LAMBERT (179) p. 494.

†*Leptechinus*, n. g. with genotype *L. gracilis*, Lower Carboniferous Hunsrückenwald, Elsass; TORNQUIST (327) Abh. geol. Karte Elsass, v, p. 63, n. sp. [Nom. gen. preocc., v. supra.]

†*Linthia*:—*L. arizensis*? (p. 435), *L. aurisleporis* (p. 435), *L. batyolcos* (p. 435), *L. cuoghii* (p. 434); MAZZETTI (225).—*L. capellinii*; BOTTO-MICCA (41) p. 353.—*L. capellinii* Loriol = *Prenaster falax* Mazz. (p. 434), *L. cavernosa* (p. 435), *L. inflata* (p. 435), *L. insignis* (p. 433), *L. locardi*? (p. 434), *L. perplexa* (p. 434), *L. subelliptica* (p. 434), *L. subglobosa* (p. 433); MAZZETTI (225).

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L. cevense, Pliocene of Ceva, Piedmont; BOTTO-MICCA (41) Boll. Soc. geol. Ital. xv, p. 353, pl. x.—*L. fraasi*, probably Cenomanian of Ghazir, Lebanon; LORIOL (195) Rev. Suisse Zool. v, p. 174, pl. viii.—*L. peolæ*, Pliocene of Mt Castello, Alessandria, Piedmont; BOTTO-MICCA (41) Boll. Soc. geol. Ital. xv, p. 352, pl. x.—*L. spiennesensis*, zone of *Bel. mucronata*, Spiennes, Belgium; SCHLUETER (297) p. 48, pl. ii; LAMBERT (180) p. 188 : n. spp.

†*Lovenia forbesi*, with synonymy; PRITCHARD (272) p. 143.

†*Lychnidius* Pomel, maintained but removed from *Caratomidæ* to *Echinobrissidæ*, and distinguished from *Trematopygus* (p. 160); *L. analis* (olim *Nucleolites*) Ag. non d'Orb. (p. 164); *L. scrobiculatus* (olim *Nucleolites* vel *Echinobrissus*), redescr. (p. 162, pl. v); LAMBERT (180).

†*Lysechinidæ*, n. fam. of *Plesiocidaroida*, with unique *Lysechinus*, n. g. with genotype *L. incongruens*, St Cassian Beds, Trias, St Cassian, Tyrol; GREGORY (110) p. 1001, n. sp.

†*Macrodiadema*, n. g. with genotype *M. ciplyensis*, Senonian of Ciply, based on spine; LAMBERT (180) Bull. Soc. Belge Geol. ser. 2, xi, p. 146, pl. ii, n. sp.

†*Macropneustes*:—*M. desorii*?; BOTTO-MICCA (41) p. 365.—*M. marmoræ*, vide sub *Spatangus*.—*M. meneghini*, is a *Hypsospatangus*; MAZZETTI (225) p. 429.

M. zitteli, volcanic tuff, Eocene, above Kavak-Mahle near Haskovo, Bulgaria; BONTSCHEFF (40) Jahrb. geol. Reichsanst. xlvi, p. 372, pl. iv, n. sp.

†*Magnosia pulchella*; KILIAN (157) p. 768.

Maretia:—†*M. grignonensis*; BOTTO-MICCA (41) p. 368.—†*M. pareti*, probably not a *Maretia*; MAZZETTI (225) p. 428: vide sub *Spatangus*.—*M. planulata*; PFEFFER (267) p. 46: colour, Funafuti; WHITELEGGE (346) p. 157.

Mellita, characters that separate it from *Encope* (p. 435); *M. stokesi*, its relations to *Monophora* (p. 437); LAHILLE (176).

Melobosis, syn. of *Salmacis*; LAMBERT (179) p. 497.

†*Melonites*:—*M. indianensis*; JACKSON (139) p. 183.

M. giganteus, Lower Subcarboniferous, Bowling Green, Ky., arrangement of plates fully described and compared with *M. multiporus*; JACKSON (139) p. 172, pls. iv & v.—*M. septenarius*, Warsaw group of Lower Carboniferous, Buzzard Roost, Franklin Co., Ala., plates of interambulacrum discussed; JACKSON (139) p. 182, pl. ix : n. spp.

†*Melonitidæ*, discussed; TORNQUIST (327) p. 735: defined, includes *Rhoechinus*, *Palaechinus*, *Oligoporus*, and *Melonites*; JACKSON (139) p. 239.

†*Menuthiaster*, n. g. with genotype *M. cotteaui*, Cretaceous, ? Senonian, near Diégo-Suarez, Madagascar, placed in fam. *Aeropidæ*, apex and plastron figured; LAMBERT (178) Bull. Soc. geol. France, ser. 3, xxiv, p. 325, pl. xi, n. sp.

Metalia sternalis; PFEFFER (267) p. 46.

†*Metaporhinus*:—*M. convexus*, Tithonian, Tunis; GAUTHIER (98) p. 17: Oxfordian of Orléansville, Algeria; REPELIN (270) p. 51.—*M. transversus*; KILIAN (157) p. 679.

†*Micraster*:—*M. atacamensis* Philippi, referred to *Schizaster*; IHERING (136) p. 338.—*M. breviporus*, contrasted with *M. cor-testudinarium*; LEONHARD (187) pp. 41 & 42.—*M. breviporus* (v. *Leskei*), Rathsbruche, Lüneburg; STOLLEY (319) p. 143.—*M. brevisulcatus*; MAZZETTI (225) p. 426.—*M. cor-anguinum*; FOURNIER (85) pp. 159 & 160; STOLLEY (319) pp. 147, 171, and (320) p. 272.—*M. cortestudinarium*, var., Rathsbruche, Lüneburg; STOLLEY (319) p. 142: fig. 401 of ZITTEL-EASTMAN (357) should be *M. decipiens*, Lower Senonian, Normandy; LAMBERT, Rev. crit. Pal. i, p. 113.—*M. decipiens*, from Lebanon; LORIOL (195) p. 169.—*M. gibbus*; STOLLEY (319) p. 171, & (350) p. 247:

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redescr. for comparison with *M. meunieri*; LAMBERT (178) p. 327, pl. xii.—*M. glyphus*; STOLLEY (319) p. 171, and (320) p. 272.—*M. gottschei* (p. 147), maintained (p. 171); STOLLEY (319), & (320) pp. 247, 272.—*M. haasi*, maintained; STOLLEY (319) p. 171.—*M. heberti*; FOURNIER (85) p. 164.—*M. idæ* Cott., is syn. of *Brissopsis cretacea*; SCHLUETER (297) p. 37.—*M. leskei* of various authors discussed at intervals; SCHLUETER (297) pp. 18–34.—*M. schræderi*, maintained; STOLLEY (319) p. 171.

M. (?) *ciplyensis* [Danian ?], Ciply; SCHLUETER (297) Zeitschr. Deutsch. geol. Ges. xlix, p. 18 footnote, pl. ii: separated from *M. gibbus*, *M. senonensis*, and *M. fastigiatus*, diagnosed; LAMBERT (180) p. 185, pl. ii.—*M. fortini*, Middle Senonian, with *M. cor-anguinum*, Carrière Montigny, W. of Dieppe; LAMBERT (178) Bull. Soc. geol. France, ser. 3, xxiv, p. 328 footnote, pl. xii: Lambert's description repeated and type refigured in FORTIN (84) p. 90, pl. v.—*M. meunieri*, Cretaceous, ? Senonian, Ambohimarina, near Diégo-Suarez, Madagascar; LAMBERT (178) Bull. Soc. geol. France, ser. 3, xxiv, p. 326, pl. xii : n. spp.

Microcyphus maculatus, colour of spines; PFEFFER (267) p. 46.

†*Micropeltis*, redefined, its place in system; LAMBERT (179) p. 516.

†*Micropsidia*, probably should not contain *Cyphosoma schlumbergeri* and *C. verneuili*, and certainly not *C. ameliæ*; ARNAUD (14) p. 238: place in system; LAMBERT (179) p. 496.

M. savini, Middle Eocene of Bertrandon, near Aragon, also Caunettes Hautes (Aude), and Les Garrigues de Villegailhenc (Aude), ambulacrals and an abnormal apex figd; LAMBERT (179) Bull. Soc. geol. France, ser. 3, xxv, p. 501, pl. xviii, n. sp.

†*Micropsina baudoni*, referred to *Circopeltis*; LAMBERT (179) p. 517.

†*Micropsis*, place in system (p. 499); *M. fraasi*, referred to *Triplacidia* (p. 504); *M. frossardi*, referred to *Micropsidia* (p. 500); *M. lorioli*, referred to *Triplacidia* (p. 504); *M. mokattanensis*, probably a *Thylechinus* (p. 503); LAMBERT (179).—*M. petrocoriensis*, compared with other spp. of *Micropsis* and *Micropsidia*, forms a distinct section; ARNAUD (14) p. 238.—*M. petrocoriensis*, referred to *Thylechinus* (p. 504); *M. stachei*, referred to *Triplacidia* (p. 504); *M. vilanovæ*, referred to *Micropsidia* (p. 500); LAMBERT (179).

†*Miocyphosoma*, syn. of *Rachiosoma*; LAMBERT (179) p. 498.

†*Miotoxaster collegnoi*; LAMBERT in KILIAN (157) p. 756, footnote.

†*Mistechinus*, n. g. with type *M. mayeri*, Eocene, Oasis de Moëleh (50 kil. S. of Fajouim); LORIOL (196) Mem. Soc. Geneve, xxxii, p. 9, pl. i, n. sp.

†*Monodiadema*, defined, allied to *Acrosalenia*; GAUTHIER (98) p. 11.—*M. cotteaui*, redescribed with a young specimen, Pterocerian of S. Tunis; GAUTHIER (98) pp. 12, 16, pl. xxxii.

†*Monophora darwini*, study of variation, and affinities; LAHILLE (176) & (177): incl. *Scutella geometrica* Bravard, older Tertiary but horizon uncertain; IHERING (136) p. 337.

†*Nœtlingia*, nom. nov., vide sub *Protechinus*.

†*Nucleolites* Desor does not = *Nucleolites* Lam., which has for genotype *N. scutata*, and includes as synn. or subgenn. *Lophopygus*, *Clitopygus*, *Acromarsus*, *Taphropygus*, and *Echinobrissus* (pars) of Pomel (p. 165); *N. analis* Agassiz non d'Orb., referred to *Lychnidius* (pp. 163 & 164) *N. analis* d'Orb. non Agassiz is syn. of *Trematopygus guillieri* Cott. (p. 164); *N. minimus* Ag., what is it? (p. 170); *N. ovulum* Goldf., referred to *Lychnidius* (p. 163); LAMBERT (180).—*N. pyramidalis*; MAZZETTI (225) p. 437.—*N. roberti*; KILIAN (157) p. 761.—*N. scutata* Lam., discussed; LAMBERT (180) p. 166.—*N. cf. scutatus*; FOURNIER (85) p. 115.—*N. subtrigonatus* Catullo, is *Cardiaster*; LAMBERT (178) p. 331.

†*Nucleopygus* Ag. non Desor., redefined, with *N. minor* as genotype,

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includes most of *Nucleolites* Desor non Lam., and *Ochetus* Pomel (p. 164); *N. bourgeoisi*, discussed (p. 171); *N. coravium*, redescribed (p. 168, pl. v); LAMBERT (180).

†*Offaster*:—*O. corculum* and *O. pilula*; STOLLEY (319) p. 147, & (320) pp. 247, 272.

†*Oligoporus*:—*O. bellulus* (p. 193); *O. blairi* (p. 193); *O. coreyi*, arrangement of plates fully described and their development discussed (p. 186, pl. vi); *O. danæ*, arrangement of plates fully descr., spines (p. 193, pl. vi); *O. nobilis* & *O. sulcatus* (p. 193); JACKSON (139).

O. missouriensis, Augusta Limestone ?, Webb City, Mo., arrangement of plates fully described; JACKSON (139) p. 184, pl. ix, n. sp.

†*Oppissaster cotteri*, Tertiary of Portugal, holotype in Lisbon Museum; LORIOL (193) Mem. Direc. trav. Geol. Portugal, p. 45, pl. xiii, n. sp.

†*Orthocyphus*, n. g., with genotype *O. pulchellus* Cotteau (olim *Orthechinus* et *Cyphosoma*), and including *O. boreaui* (olim *Orthechinus*); ARNAUD (14) Act. Soc. Bordeaux, xlviii, p. 234: syn. of *Thylechinus*; LAMBERT (179) p. 496.

†*Orthechinus*, syn. of *Thylechinus*; LAMBERT (179) p. 496.—*O. boreaui* and *O. pulchellus*, compared with genotype, and removed to nov. gen. *Orthocyphus*; ARNAUD (14) p. 232.—*O. boreaui*, referred to *Thylechinus*; LAMBERT (179) p. 504.

†*Orthopsis*:—*O. repelini*; KILIAN (157) p. 768.—*O. zumoffeni*; LORIOL (195) p. 153.

O. perlata, Mæstrichtian, Mari Hills, Baluchistan; NOETLING(248) Pal. Ind. (16) i, pt. 3, p. 12, pl. ii, n. sp.

†*Palaechinoidea*, sub-cl. defined, includes orders *Cystocidarida*, *Bothriocidarida*, *Perischoechinida*; ZITTEL (356) p. 182; ZITTEL-EASTMAN (357) p. 218.

†*Palaechinus*, compared with *Rhoechinus*; JACKSON (139) p. 200: literary history, rediagnosis; TORNQUIST (327) p. 735.—*P. gigas*, ambulacrals (p. 190), ambulacrals and interambulacrals described (p. 204, pl. vii); JACKSON (139): interambulacral from Regny; JULIEN (151) p. 130.—*P. paradoxus* is a cup of *Platycrinus*; JAEKEL (144) p. 48.—*P.* (?) sp., Upper Silurian, N. S. W.; MITCHELL (236) with fig.

P. koninckı, Carboniferous Limestone, Regny, Néronde, and St-Germain-Laval, Central France; JULIEN (151) p. 130, pls. x & xi; TORNQUIST (327) p. 753.—*P. lacazei*, Carboniferous Limest., l'Ardoisière, Central France; JULIEN (151) p. 128, pl. xvi: redescr., stages of growth, comparison with other spp., nearest *P. gigas*; TORNQUIST (327) p. 742, pls. xx & xxi.—*P. robineti*, Carboniferous Limest., La Varville, Siguret, Central France; JULIEN (151) p. 129, pl. iii: why not *Rhoechinus*? TORNQUIST (327) p. 753.—*P. rutoti*, Carboniferous Limest., Domaine des Roches near Savigny-Poil-Fol, Central France; JULIEN (151) p. 129, pl. vi: ? identical with *P. lacazei*; TORNQUIST (327) p. 753 : n. spp.

†*Palæodiscidæ*, diagnosis; GREGORY (109) p. 133.

†*Palæodiscus ferox*, structure, especially of ambulacra and jaws, affinities discussed; GREGORY (109) p. 129.

Palæolampas Bell, not accepted; LORIOL (193) p. 39.

†*Palæopneustes cristatus*, young stages in development of plastron; LAMBERT (178) p. 323.

†*Pedina charmassei*; HUG (133) p. 404.

†*Pedinothuria*, n. g., with genotype *P. cidaroides*, Weisser Jura (? γ), Germany; GREGORY (108) Quart. J. Geol. Soc. liii, p. 119, pl. vii, n. sp.

†*Peltastes studeri*; KILIAN (158) p. 894.

Periaster not accepted; LORIOL (195) p. 175.

†*Pericosmus*:—*P. æqualis*; MAZZETTI (225) p. 428; BOTTO-MICCA (41) p.

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365.—*P. affinis*; MAZZETTI (225) p. 429.—*P. cf. affinis*; VINASSA DE REGNY (335) p. 155.—*P. callosus* (p. 428), *P. dilatatus* and *P. edwardsi* (p. 429); MAZZETTI (225).—*P. edwarsii* (errore pro *edwardsi*) with var. nov. *minor*, Helvetian of Cassinelle, Piedmont; BOTTO-MICCA (41) p. 365.—*P. latus*; ALESSANDRI (1) p. 70; MAZZETTI (225) p. 428; BOTTO-MICCA (41) p. 364.—*P. malatinus*; MAZZETTI (225) p. 429.—*P. peroni* and *P. spatangoides*; BOTTO-MICCA (41) p. 363.—*P.* (an *Micraster* ?) sp.; MAZZETTI (225) p. 429.

P. pedemontanus, Helvetian, "pietra da Cantoni," Cellamonte, Basso Monferrato, Italy; ALESSANDRI (1) Mem. Mus. Milano, vi (1), p. 70, pl. i, n. sp.

†*Perischoechinoida*, place of the Order in the system; JACKSON (139) p. 239: Jackson's classification criticised, another phylogeny given; TORNQUIST (327) p. 730: defined, includes families *Lepidocentridæ*, *Melonitidæ*, *Archæocidaridæ*, and *Tiarechinidæ*; ZITTEL (356) p. 183; ZITTEL-EASTMAN (357) p. 219.

†*Perischoechinidæ*, interrelations discussed, with special reference to *Archæocidaris*; TORNQUIST (326) p. 55.

†*Perischodomus biserialis* and *P. illinoisensis*, discussed; JACKSON (139) p. 225.

Peronella sp., young; PFEFFER (267) p. 46.

†*Pholidocidaris*, systematic position discussed; TORNQUIST (327) p. 767.—*P. irregularis*, discussed; JACKSON (139) p. 212.

P. gaudryi, [n. sp. ?] Carboniferous Limest., L'Ardoisière, Central France, previously referred to by Julien as *Lepidocentrus munsterianus* (1874) and *Melonites gaudryi* (1890); JULIEN (151) p. 131, pl. xvi.—*P. meeki*, Keokuk group, Warsaw, Ill., arrangement of plates fully described; JACKSON (139) p. 210, pl. ix.—*P. tenuis*, Lower Carboniferous, Hunsrückenwald, Elsass; TORNQUIST (327) Abh. geol. Karte Elsass, v, p. 767, pls. xxi & xxii : n. spp.

Phormosoma luculentum; KOEHLER (163) p. 473, and (164) p. 93.—*P. placenta*; KOEHLER (163) p. 472, and (164) p. 91.

Phyllacanthus annulifera and *P. verticillata*; PFEFFER (267) p. 45.

†*Phymechinus*, redefined, place in system; LAMBERT (179) p. 516.

†*Phymosoma*, syn. of *Cyphosoma*; LAMBERT (179) p. 499.

†*Plagiopygus*, n. g. for socalled *Pygorhynchi* of Tertiary, genotype *P. grignonensis* (olim *Nucleolites*) Defr.; LAMBERT (180) Bull. Soc. Belge Geol., ser. 2, xi, p. 162, footnote.

Plesiocidaroida, rediagnosed, affinities discussed; GREGORY (110) p. 1003.

†*Plesiopeltis*, n. g. with genotype *Leiosoma gourdoni* Cott.; LAMBERT (179) p. 517.

†*Pleurodiadema*, place in system; LAMBERT (179) p. 495.—*P. stutzi*, large specimen from Oxfordian of Tunis described; GAUTHIER (98) p. 22.

†*Pliocyphosoma*, syn. of *Cyphosoma*; LAMBERT (179) p. 499.

†*Plistophyma*, should be subgenus of *Leiosoma* (= *Trochalosoma*); LAMBERT (179) p. 515.

Porocidaris elegans, small specimen with genital plates imperforate; KOEHLER (163) p. 472, & (164) p. 89.—†*P. pseudoserrata*, referred to *Rhabdocidaris mespilum*; LAMBERT (179) p. 484.—†*P. schmideli*; GREGORIO (105) p. 111, pl. xxiv:—†*P. serraria*; ALESSANDRI (1) p. 82: and *P.* cf. *serraria*; VINASSA DE REGNY (335) p. 144.

†*Proholaster*, n. g., allied to *Collyrites*, with genotype *P. auberti*, Berriasian, Khanget Fioufi in Djebel Meloussi, Tunis; GAUTHIER (98) p. 17, pl. xxxii, n. sp.

†*Proraster* Lambert, not accepted; SCHLUETER (296) p. 968.

†*Protechinus*, n. g., with genotype *P. paucituberculatus*, Maestrichtian, Mari Hills, Baluchistan; NOETLING (248) Pal. Ind. (16) i, pl. 3, pp. 14 & 16, pls. ii & iii: n. sp. [gen. preocc. *Protoechinus* Austin

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1860, mutatum *Nœtlingia*; LAMBERT in Rev. crit. Pal. ii, pp. 125–127, 1898].

†*Prototiara*, n. g. with genotype *Pleurodiadema jutieri* Cotteau; LAMBERT (179) Bull. Soc. geol. France, ser. 3, XXV, p. 495, footnote.

†*Psammechinus*:—*P. charlesworthi*; BELL (33) p. 8.—*P. dubius*; LORIOL (194) p. 117: redescr. from Portugal, should perhaps include *P. gauthieri* and *P. serresi*; LORIOL (193) p. 6, pl. i.—*P. henslowi*; BELL (33) p. 8.—*P. monilis*; DEPÉRET (64) p. 522: with n. var. *depressa*, Pliocene of Lugagnano near Parma; VINASSA DE REGNY (335) p. 148 & fig.; said not to be this species by LAMBERT in Review.—*P. monilis*?; MAZZETTI (225) p. 418.—*P.* cf. *monilis*; ŁOMNICKI (192) p. 34.—*P. parvus*; ALESSANDRI (1) p. 81.—*P. theveneti*; KILIAN (157) p. 768.—*P. sphæroideus*; BELL (33) p. 8.

P. zumoffeni, Cenomanian, Valley of Nahr el Kelb, Bykfaya (above the village); LORIOL (195) Rev. Suisse Zool. v, p. 153, pl. vi, n. sp.

P. n. sp.; GREGORIO (105) pp. 144 & pl. XXVII.—*P.* n. sp., Pliocene, Castellarquato; VINASSA DE REGNY (335) p. 149.

†*Pseudananchis*, compared with *Lampadaster*; LAMBERT (178) p. 317.

†*Pseudarbacia*, n. g. with genotype *P. archiaci* (olim *Leiosoma*) Cott., Cretaceous; LAMBERT (179) Bull. Soc. geol. France, ser. 3, XXV, p. 515.

†*Pseudocidaris crenularis*; KILIAN (157) p. 685.

†*Pseudodiadema*:—*P. brongniarti*; KILIAN (158) p. 894.—*P. dubium*; ALMERA (3) pp. 567 & 568.—*P. lenticulatum*; PARONA & BONARELLI (259) p. 82.—*P. libanoticum* Loriol, 1887; that of Cotteau 1893 changed to *P. saninensis*, nom. nov.; LORIOL (195) p. 148.

P. jessoni, Oxford clay, St Ives, Hunts., England; GREGORY (107) Ann. Nat. Hist. (6) xviii, p. 465, n. sp.

†*Psilosoma*, syn. of *Thylechinus*; LAMBERT (179) p. 497.

†*Pygaster umbrella*: HUG (133) p. 404.

†*Pygaulus*:—*P. cylindricus* & *P. depressus* (p. 761), *P. desmoulinsi* (p. 768); KILIAN (157).—*P. ovatus*; ALMERA (3) p. 567.

†*Pygopistes* Pomel, "pas indispensable"; LAMBERT (180) p. 162, footnote.

†*Pygorhyncus*:—*P. colombi*; MAZZETTI (225) p. 437.—*P. grignonensis* made type of n.g. *Plagiopygus*; LAMBERT (180) p. 162, footnote.

†*Pygurus*:—*P. lampas*; LEONHARD (187) p. 29: supposed to be from Upper Greensand but proves to be Cenomanian; JUKES-BROWNE & HILL (150) p. 145.—*P. montmollini* (p. 722), *P. rostratus* (pp. 721 & 722); KILIAN (157).

P. meslei, Kimeridgian ?, Ksar-Dagra near Tatouine, S. Tunis; GAUTHIER (98), p. 7, pl. XXXII, n. sp.

†*Pyrina*:—*P. ataxensis*, nn. varr. *pentagonalis*, *tumida*, et *globosa*, Mæstrichtian, Mari Hills, Baluchistan; NOETLING (248) Pal. Ind. (16) i, pt. 3, p. 19, pls. iii & iv.—*P. houzeaui*, redescr., apex figd, also a senescent individual; LAMBERT (180) p. 156.—*P. ovulum*; GREGORIO (105) p. 111.

P. gigantea, Mæstrichtian, Mari Hills, Baluchistan; NOETLING (248) Pal. Ind. (16) i, pt. 3, p. 21, pl. iv.—*P. lamberti*, Ghazir (above the village), and *P. zumoffeni*, Ghazir (below the village), Cenomanian, Lebanon; LORIOL (195) Rev. Suisse Zool. v, p. 159, pl. vii : n. spp.

†*Rachiosoma*, incl. *Miocyphosoma* & *Actinophyma*, place in system; LAMBERT (179) p. 498: vide sub *Gauthieria*.—*R. paucituberculatum*, KILIAN & ZURCHER (160) p. 964.—*R. peroni*, apex figd; LAMBERT (179) p. 510.

R. grossouvrei, Danian, "Poudingue de la Malogne," Ciply; LAMBERT (180) Bull. Soc. Belge Geol., ser. 2, xi, p. 154, pl. iii, n. sp.

Regulares, order defined, includes suborders *Holostomata*, *Glyphostomata*; ZITTEL (356) p. 185: Polian vesicles and others; LUDWIG (201).

†*Rhabdocidaris*:—*R. caprimontana*; KILIAN (157) pp. 680, 685 & 686;

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KILIAN & ZURCHER (160), pp. 960–962.—*R. crassissima*; KILIAN (157) p. 721; PARONA & BONARELLI (259) p. 82.—*R. itala*; BONTSCHEFF (40) p. 368.—*R. kiliani*; KILIAN (157) p. 721; KILIAN & LEENHARDT (159) p. 975.—*R. mespilum*, redescr., incl. *Cidaris* vel *Porocidaris pseudoserrata*; LAMBERT (179) p. 484.—*R.* ? *orbignyana* Desor., spine only, S. Tunis; GAUTHIER (98) p. 16.—*R. pouechi*, spines discovered in association with plates; LAMBERT (179) pp. 484, 486, pl. xviii.—*R. pouyannei*; PERON (261) pp. 295, 298.—*R. trispinata*; SCHLUETER (298) p. 946.—*R. simondai*, single spine; LORIOL (193) p. 5, pl. i.—*R. tuberosa*; KILIAN (157) p. 721.—*R.* sp.; ROMAN (281) p. 330.

†*Rhoechinus*, discussed and rediagnosed; TORNQUIST (327): compared with *Palæchinus*; JACKSON (139) p. 200.—*R. burlingtonensis* (olim *Palechinus*) discussed; *op. cit.* p. 203.—*R. elegans*, ambulacrals and interambulacrals described; *op. cit.* pp. 190, 204, pl. vii: redescribed, comparison with other species; TORNQUIST (327) p. 757, pls. xx & xxi.—*R. gracilis* (olim *Palechinus*), arrangement of plates fully described; JACKSON (139) pp. 193, 201, pl. vii.

†*Rhynchopygus woodi*; BELL (33) p. 10.

Salenia, the species divided into groups *quadratæ* and *coronatæ* according to scrobicular ornament of tubercles; ARNAUD (15) p. 25.—*S. anthophora* Müller, discussed; LAMBERT (180) p. 148.—†*S. bourgeoisi*, apical plates described, growth-stages measured and distinguished from those of *S. mæstrichtensis*; ARNAUD (15) p. 11, pl. i.—†*S. clarkii* ?, Cenomanian, Devon; JUKES-BROWNE & HILL (150) p. 145.—†*S. cylindrica*, measured, apical plates described; ARNAUD (15) p. 16.—†*S. fraasi*, redescribed; LORIOL (195) p. 146, pl. vi.—*S. geometrica*, reestablished, apical plates described, growth-stages measured; ARNAUD (15) p. 9, pl. i.—†*S. gibba*, apical plates described; ARNAUD (15) p. 5.—*S. hastigera*; KOEHLER (163) p. 472, & (164) p. 89.—†*S. heberti*, recognised in Upper Campanian of Talmont (Charente-Inf.), measurements compared with those given by Schlueter; ARNAUD (15) p. 14.—†*S. mæstrichtensis*, discussed; LAMBERT (180) pp. 149, 151.—†*S. petalifera*, var. aff. *S. scutigera*, loc. not given; JUKES-BROWNE & HILL (150) p. 145.—*S. prestensis*; ALMERA (3) p. 568; KILIAN (157) p. 761.—†*S. radians*, measurements and ornament distinguish it from other spp.; ARNAUD (15) p. 15.—†*S. scutigera* Cott., perhaps not the same as *Cidaris scutigera* Goldf.; LAMBERT (180): Cotteau wrongly referred to this *S. geometrica*, *S. maxima*, and *S. petalifera*; ARNAUD (15) p. 5.—†*S. trigonata*, apical plates described, growth-stages and mutations measured; ARNAUD (15) p. 12.

†*S. belgica*, Cretaceous, Danian; "Poudingue de la Malogne," Ciply, distinguished from *S. minima*; LAMBERT (180) Bull. Soc. Belge Geol. ser. 2, xi, p. 150, pl. iii.—†*S. maxima*, Middle Campanian of Saint-Seurin d'Uzet, and Upper Campanian of Talmont (Charente-Inf.) and of Courgeac (Charente), description and measurements of adult and young; ARNAUD (15) Act. Soc. Bordeaux, lii, p. 23, pls. ii & iii.—†*S. pesmei*, Lower and Middle Dordonian, Royan (Charente-Inf.), descr. and measured; *op. cit.* p. 27, pl. ii.—†*S. rejaudryi*, Lower Campanian, Blanzac Livernant, Montmoreau (Charente), description of adult, also of two young (15 & 16 mm. diam.) one with peculiar apex, the other with peculiar madreporite; *op. cit.* p. 18, pl. ii: n. spp.

†*Salenidia bonissenti* (olim *Salenia*) Cotteau, redescribed and defined; LAMBERT (180) p. 148, pl. ii.

Salmacis, place in system, incl. *Melobosis*, *Diploporus*, and *Salmacopsis* (p. 497); †*S. vandenhecki* referred to *Triplacidia* (p. 504); LAMBERT (179).

Salmacopsis, syn. of *Salmacis*, LAMBERT (179) p. 497.

Schizaster:—†*S. acuminatus*; KAYSER (153); BOTTO MICCA (41) p. 360:

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contains more than one species, SCHLUETER (296), p. 966.—†*S. ambulacrum*; MAZZETTI (225) p. 431; BOTTO MICCA (41) p. 360.—†*S. archiaci* (p. 433), †*S. aff. archiaci* (*var. lata*) (p. 430), †*S. baylei* (p. 432); MAZZETTI (225).—*S. baylei*; †*S. bellardii*, redescr. from type; BOTTO-MICCA (41) p. 357.—†*S. beloutchistanensis*?; MAZZETTI (225) p. 432.—†*S. canaliferus*; MAZZETTI (225) p. 431: probably incl. *S. orbignyanus* Al. Ag.; VINASSA DE REGNY (335), p. 152: by no means, but rather in a different genus; LAMBERT in Review.—†*S. convexus*; MAZZETTI (225) p. 430.—†*S. corsicus*; BOTTO-MICCA (41) p. 354.—†*S. cristagalli*; MAZZETTI (225) p. 433.—†*S. desori*; MAZZETTI (225) p. 432, BOTTO-MICCA (41) p. 361.—†*S.*, cf. *desori*; VINASSA DE REGNY (334) p. 154.—†*S. djulfensis*?; BOTTO-MICCA (41) p. 361.—†*S. d'urbani* (p. 431), †*S. exagonalis* (p. 430), †*S. foveatus* (p. 432), †*S. globulus* (p. 432); MAZZETTI (225).—†*S. karreri*; ŁOMNICKI (192) p. 34; BOTTO-MICCA (41) p. 359.—†*S. lacunosus* Goldf., holotype at Bonn, redescr., incl. *Micraster goldfussi* Ag., *Spatangus crassissimus* Desmoul., *Hemiaster amplus* Des., locality and horizon unknown; SCHLUETER (296) p. 963.—†*S. laubei*; MAZZETTI (225) p. 430.—†*S. laubei* Hoernes non Bittner; BOTTO-MICCA (41) p. 356.—†*S. lorioli*; MAZZETTI (225) p. 432.—†*S. maccarthyi*, Lower Eocene of Mt. Raouïa, Algeria; REPELIN (279) p. 119.—†*S. major*; BOTTO-MICCA (41) p. 356: incl. *S. canaliferus* Sism. non Agass.; ALESSANDRI (1) p. 72.—†*S. maurus*; BRIVE (45) pp. 597 & 598.—†*S. oviformis* (p. 430), †*S. parkinsoni* (p. 432); MAZZETTI (225).—*S. philippi*; MEISSNER (228) p. 89.—†*S. phrynus*, Tortonian, plain of Chellif, Algeria; REPELIN (279) p. 175.—†*S. princeps*, p. 432.—†*S. pumilius* (p. 433), †*S. rimosus* (p. 431); MAZZETTI (225).—*S. rimosus*; BOTTO-MICCA (41) p. 362: varying in direction of *S. vicinalis*; BONTSCHEFF (40) p. 370.—†*S.* cf. *rimosus*; FOURNIER (85) pp. 179, 182.—†*S. roemeri*; FRIČ (91) p. 72.—†*S. rotundus*; MAZZETTI (225) p. 430.—†*S. scillæ*; ALESSANDRI (1) p. 71; MAZZETTI (225) p. 431: discussed; SCHLUETER (296) p. 964: redescribed fr. Portugal; LORIOL (193) p. 43, pl. xii: var. nov. *pliocenica*, from Asti; BOTTO-MICCA (41) p. 534.—†*S. studeri*; MAZZETTI (225) p. 433; BOTTO-MICCA (41) p. 359: var. nov. *haskoviensis*, Eocene "Gelbe Schicht," Haskovo, Bulgaria; BONTSCHEFF (40) Jahrb. geol. Reichsanst. xlvi, p. 371.—†*S. trigonalis*; MAZZETTI (225) p. 429.—†*S. vicinalis*; MAZZETTI (225) p. 431, BOTTO-MICCA (41) p. 359: discussed; SCHLUETER (296) p. 965.—†*S.* sp.; VINASSA DE REGNY (335) pp. 153 & 154.

†*S. ameghinoi*, Lower Tertiary, Gulf of S. Jorge, Patagonia; IHERING (136) Revist. Mus. Paulista, ii, p. 338.—†*S. braidensis*, Placentian of Mt. Castello, Alessandria, and Mt. Capriolo near Bra, Piedmont; BOTTO-MICCA (41) Boll. Soc. geol. Ital. xv, p. 362, pl. x.—†*S. ozzanensis*, Helvetian "pietra da Cantoni," Ozzano, Basso Monferrato, Italy; ALESSANDRI (1) Mem. Mus. Milano, vi (1), p. 73, pl. ii.—†*S. pyriformis* [errore pro *piriformis*], Tongrian of Carcare, Piedmont; BOTTO-MICCA (41) Boll. Soc. geol. Ital. xv, p. 358, pl. x.—†*S. aff. scillæ*, Helvetian and Astian, Piedmont; BOTTO-MICCA (41) Boll. Soc. geol. Ital. xv, p. 355 : n. spp.

Scutella, relations of genus to *Monophora* with discussion of spp. *subrotunda*, *truncata*, *propinqua*, *striatula*, *producta*, *paulensis*, *stellata*, *smithiana*, in terms of variations noted in *M. darwini*; LAHILLE (176) p. 437.—†*S. bonali* Tournouër, Aquitanian of Pindères (Lot et Garonne), described [If, as is suggested, Tournouër never published a description, this must rank as n. sp.]; LORIOL (193) p. 12.—*S. faujasi*, probably incl. *S. producta*, *S. propinqua*, and *S. stellata*; LAHILLE (176) p. 439: redescr. fr. Portugal, incl. *S. truncata*, *S. brongniarti*, and *S. smithi*; †LORIOL (193) p. 10, pl. i.—†*S. patagonensis* Des., Sta. Cruz formation, Porto St Desiré; IHERING (136) p. 337.—†*S. striatula*;

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RAULIN (274).—†*S. subrotunda*, redescr. fr. Portugal; LORIOL (193) p. 9, pl. iii: probably incl. *S. paulensis*, *S. truncata*, *S. striatula*, and *S. brongniarti*; *S. subtetragona*, distinct, but allied to *S. subrotunda*; LAHILLE (176) p. 439.

†*S. lusitanica*, Miocene, various localities in Portugal; LORIOL (193) Mem. Direc. Trav. Geol. Portugal, p. 12, pls. ii & iii.—†*S. roquettei*, Miocene, Portugal, loc. unknown, holotype in Lisbon Museum, perhaps young of *S. faujasi*; *op. cit.* p. 13, pl. iii : n. spp.

Scutellidæ, relations of genera, in 3 sections, *Rotulinæ*, *Scutellinæ*, and *Monophorinæ*; LAHILLE (176) p. 440.

†*Sismondia*:—*S. loghotheti*, Upper Egypt; FOURTAU (86).—*S. marginalis*, var. *minor*; COURJAULT (58).—*S. planulata*, Mokattam, Egypt; FOURTAU (86).

†*Spatangopsis costata* Torell, possibly an Echinoderm, but not Cystocidaroid; GREGORY (109) p. 133.

†*Spatangus*:—*S. æquedilatatus*; MAZZETTI (225) p. 422.—*S. amygdala* Goldf. non Klein; SCHLUETER (297).—*S. arcuatus*; MAZZETTI (225) p. 418.—*S. asterias*; BOTTO-MICCA (41) p. 374.—*S. austriacus*; MAZZETTI (225) p. 423; VINASSA DE REGNY (335) p. 155.—*S. austriacus* vel *S. manzonii*; *loc. cit.*—*S.* aff. *austriacus*; ŁOMNICKI (192) p. 34.—*S. britannus*, redescr. and figd; COTTEAU (56) p. 176.—*S. brissoides*, distinguished from *S. loncophorus*; MAZZETTI (225) p. 423 and pl.—*S. chitonosus*; BOTTO-MICCA (41) p. 371: incl. *S. euglyphus* Mazz. non Laube; MAZZETTI (225) p. 421.—*S. cor*, perhaps syn. of *S. philippii*; MAZZETTI (225) p. 423.—*S. corsicus*; ALESSANDRI (1) p. 69: redescr.; BOTTO-MICCA (41) p. 369: redescr. from Portugal; LORIOL (193) p. 47, pl. xiii: redescr., figd, and distinguished from *S. delphinus*; COTTEAU (56) p. 166: ?; MAZZETTI (225) p. 419.—*S. delphinus*; MAZZETTI (225) p. 418: descr. and figd [according to the author, for the first time]; COTTEAU (56) p. 179.—*S. desmarestii*; BOTTO-MICCA (41) p. 374: ?; MAZZETTI (225) p. 418.—*S. discoidalis* (p. 422); *S. hemiornatus*, holotype was young (p. 424); *S. hemisphæricus* (p. 420); MAZZETTI (225).—*S. marmoræ*, olim *Macropneustes*, redescr. and figd; COTTEAU (56) p. 171.—*S. mutinensis*; MAZZETTI (225) p. 424.—*S. ocellatus*; MAZZETTI (225) p. 422.—*S.*, cf. *S. ocellatus*, Helvetian, Turin; BOTTO-MICCA (41) p. 373, pl. x.—*S. pagliarolensis*; MAZZETTI (225) p. 421.—*S. pareti*, not a *Maretia*; COTTEAU (56) p. 194; BOTTO-MICCA (41) p. 370.—*S. peroni*, redescr. and figd; COTTEAU (56) p. 169.—*S. philippii*; MAZZETTI (225) p. 420; BOTTO-MICCA (41) p. 374.—*S. podex*; MAZZETTI (225) p. 422.—*S. purpureus*; BELL (33) p. 11: Agassiz non Leske, recent and fossil; MAZZETTI (225) p. 424 and pl.: Leske non Agassiz=*S. spinosissimus* Desor; MAZZETTI (225) p. 425.—*S. regina*; BELL (33) p. 11; MAZZETTI (225) p. 420.—*S. rissoi*; BOTTO-MICCA (41) p. 374: descr. and figd [according to the author, for the first time]; COTTEAU (56) p. 187: ?; MAZZETTI (225) p. 424.—*S. semelanensis*; MAZZETTI (225) p. 423.—*S. siculus* Desor ex Parkinson, does not equal *S. siculus* Agassiz, 1847, but rather *S. philippii* Desor; COTTEAU (56) p. 195.—*S. simplex*, redescr. and figd; COTTEAU (56) p. 174.—*S. spinosissimus*, probably includes *S. purpureus* Lam., *S. siculus* Desor, and *S. meridionalis* Risso; MAZZETTI (225) p. 419 and pl.—*S. subconicus*; MAZZETTI (225) p. 420.—*S. subinermis*; BRIVE (45) p. 598.—*S. tesselatus*, Tortonian, plain of Chellif, Algeria; REPELIN (279) pp. 174 & 175.—*S. viquesneli*; BONTSCHEFF (40) p. 373.

S. deydieri, quoted as "Cotteau, 1894," but probably is new, Miocene (Burdigalian) of Reillane (Basses-Alpes), and var. *major*, Tortonian of Cucuron (Vaucluse); COTTEAU (56) Bull. Soc. Isere (4) iii, p. 185, pl. x, figg. 2–4, pl. xi, figg. 1 & 2.—*S. gauthieri*, quoted as "Cotteau, 1894," but probably is new, Miocene (Burdigalian) of St Paul-Trois-

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Châteaux (Drôme); *op. cit.* p. 183, pls. ix & x, fig. 1.—*S. heinzi*, quoted as "Gauthier, 1894," but probably is new, descr. but not figd as plate is lost; *op. cit.* p. 190.—*S. manzonei*, Astian of Asti, Piedmont; BOTTO-MICCA (41) Boll. Soc. geol. Ital. xv, p. 372, pl. x. [Said by LAMBERT in Review to be *S. botto-miccai* Vinassa de Regny.] *S.* aff. *pareti*, Miocene of Ceva and Clavesana, Piedmont; *op. cit.* p. 371 : n. spp.

†*Sphærechinæ*, sub-fam. of *Echinometridæ*; LAMBERT (179) p. 516.

Sphærechinus:—†*S. brevispinosus*; BELL (33) p. 9.—*S. granularis*; MARCHISIO (216) p. 4: structure and functions of vesicles connected with lantern; UEXKÜLL (331): larva; SEELIGER (304): karyokinesis; DOFLEIN (70), & HERTWIG (128).

Sperosoma, n. g., with genotype *S. grimaldi*, near Azores; KOEHLER (168) Zool. Anz. xx, p. 302, and fig, n. sp.

†*Stegaster*, compared with *Lampadaster*; LAMBERT (178) p. 316.—†*S facki* Stolley, is a *Cardiaster*; LAMBERT (180) p. 178.

†*S.*, n. sp.; FOURNIER (85) Ann. Fac. Marseille, vii, p. 161.

Stenonia, plastron discussed; LAMBERT (178) p. 322.

†*Stereocidaris silesiaca*; LEONHARD (187) p. 40.

†*S. oppoliensis*, Turonian of Oppeln, Oberschlesien; LEONHARD (187) Palæontogr. xliv, p. 40, pl. v, n. sp.

†*Stomechinus perlatus*; HUG (133) p. 404.—†*S.* sp.; ROMAN (281) p. 330.

Stomopneustes variolaris; PFEFFER (267) p. 46.

†*Strictechinus*, syn. of *Arcopeltis*; LAMBERT (179) p. 517.

Strongylocentrotus albus, with crab parasite; MEISSNER (228) p. 86.—*S. drobachiensis*; †BELL (33) p. 9: (as *Echinus*); HONEYMAN (131) p. 256: ambulacrals and inter-ambulacrals; JACKSON (139) pl. iii: two specimens with abnormal arrangement of oculars, ? a reversion; OSBORN (252): large size in Greenland waters, six pores to ambulacral plate; VANHOEFFEN (333) p. 235.—*S. eurythrogrammus*, Wellington, N. Z.; FARQUHAR (83) p. 189.—*S. lividus*; †BELL (33) p. 9; MARCHISIO (216) p. 4: karyokinesis; DOFLEIN (70), & HERTWIG (128).—†*S. scaber*; BELL (33) p. 9.—*S. tuberculatus*, New Zealand; FARQUHAR (83) p. 189.

†*S. cotteaui*, Coralline Crag, Aldborough; BELL (33) Rep. Yorksh. Soc. for 1896, p. 9, n. sp.

†*Temnechinus*:—*T. excavatus*, *T. globosus*, *T. melocactus*, *T. turbinatus*, and *T. woodi*; BELL (33) pp. 7 & 8.

T. forbesi, Coralline Crag, Oxford, Ramsholt; BELL (33) Rep. Yorksh. Soc. for 1896, p. 8, no fig, n. sp.

†*Temnocidaris danica*, includes spines called *Cidaris faujasi*; LAMBERT (180) p. 145.

Temnopleurus, place in system, incl. *Toreumatica* and *Temnotrema*; LAMBERT (179) p. 497.

Temnotrema, syn. of *Temnopleurus*; LAMBERT (179) p. 497.

†*Thylechinus*, incl. *Orthechinus*, *Gagaria*, *Orthocyphus*, *Psilosoma*; LAMBERT (179) p. 496.—*T. atacicus* (olim *Cyphosoma*) Cotteau 1861, non 1856, apex figured; LAMBERT (179) p. 503.—*T. rejaudryi*, redescribed and referred to *Hemithylus*, n. g.; ARNAUD (14) p. 236.

†*Tiarechinidæ* rediagnosed; GREGORY (110) p. 1003.

†*Tiarechinus* discussed; GREGORY (110) p. 1000: its place in the system; JACKSON (139) p. 243.

Toreumatica, syn. of *Temnopleurus*; LAMBERT (179) p. 497.

†*Toxaster*:—*T.* cf. *campichei*; FOURNIER (85) p. 128.—*T. collegnoi*; FOURNIER (85) pp. 132, 139; KILIAN (157) pp. 753, 754, 756, 768: vide *Echinospatagus*.—*T. complanatus*, vide *T. retusus*.—*T. dieneri*, with var. *alta*, redescr.; LORIOL (195) p. 168, pl. vii.—*T. gibbus*; KILIAN & ZURCHER (160) pp. 964 & 965.—*T. granosus*; KILIAN (157)

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p. 722, & (158) p. 893; KILIAN & ZURCHER (160) p. 963; LAMBERT in KILIAN & LEENHARDT (159) p. 973: apex varying in direction of *T. africanus*, figured; LAMBERT (178) p. 321.—*T.* aff. *T. granosus*, Lower Neocomian of Venascle; LAMBERT in KILIAN & LEENHARDT (159) p. 974.—*T. granosus*, var. or perhaps n. sp.; LAMBERT in KILIAN (157) p. 726, footnote.—*T.* cf. *neocomiensis*, with abnormal apical system; LAMBERT in KILIAN & LEENHARDT (159) p. 979, fig. 1.—*T. retusus*; KILIAN (157) pp. 734, 746, and LAMBERT in KILIAN (157) p. 736; KILIAN (158) p. 893; KILIAN & LEENHARDT (159) pp. 976, 980; KILIAN & ZURCHER (160) pp. 964 & 965: variation in apex; LAMBERT (178) p. 320.—*T.* cf. *retusus*; KILIAN & LEENHARDT (159) p. 975.—*T. ricordeaui*; *op. cit.* p. 977.—*T. roulini*, carefully redescr. and figd on evidence of 71 specimens from Aptian of Zapatoca (Santander) in Cordilleras of Bogota; GERHARDT (99) p. 189.—*T. subcavatus*, development of apex; LAMBERT (178) p. 321.—*T.* aff. *T. subcylindricus*, Lower Neocomian of Moustiers (Basses-Alpes); LAMBERT in KILIAN & LEENHARDT (159) p. 974.

T. libanoticus, Cenomanian, Lebanon; LORIOL (195) Rev. Suisse Zool. v, p. 166, pl. vii.—*T. lorioli*, Valanginien of Basses-Alpes, also incl. *T. ricordeaui* of "Echinologie Helvétique," pl. xxviii, fig. 5; LAMBERT in KILIAN & LEENHARDT (159) Bull. Soc. geol. France (3) xxiii, p. 974: n. spp.

†*Toxobrissus michelotti* should be *Brissopsis*; BOTTO-MICCA (41) p. 351.

Toxopneustes variegatus; DUERDEN (77) p. 285.

†*Trematopygus* d'Orb., maintained but restricted, includes *Plagiochasma* Pomel and *Dochmostoma* (pars) Duncan, genotype is *Nucleolites olfersi* Agassiz; LAMBERT (180) p. 160.—*T. oblongus* d'Orb., referred to *Lychnidius*; LAMBERT (180) p. 163.

†*Tretechinus*, n. g., with genotype *T. illinoisensis* (olim *Perischodomus*) Worthen, St John, & Miller; TORNQUIST (327) Abh. geol. Karte Elsass, v, p. 784.

Trigonocidaris albida; KOEHLER (163) p. 472, & (164) p. 90.

†*Triplacidia*, place in system; LAMBERT (179) p. 497.—*T. vandenheckei*, nov. var. *rothpletzi*, *Lithothamnium* limestone, Haskovo, Bulgaria; BONTSCHEFF (40) Jahrb. geol. Reichsanst. xlvi, p. 368.

Tripneustes:—†*T. parkinsoni*; MAZZETTI (225) p. 418.—*T. variegatus*, Klein, Kermadec Is., descr. and measured; FARQUHAR (83) p. 188.

†*Typhlechinus*, syn. of *Palechinus*; TORNQUIST (327) p. 737, footnote.

†*Trochalosoma*, nom. nov. pro *Leiosoma* Cotteau non Brandt, genus defined and placed in system; LAMBERT (179) p. 515.

†*Xenocidaris*, provisionally retained in *Archæocidaridæ* on account of spines of genotype *X. clavigera*; JACKSON (139) p. 222.—*X. clavigera*; BEYER (38) p. 89, pl. iii, figg. 80 & 81.

†*Zeuglopleurus*, syn. of *Echinocyphus*; LAMBERT (179) p. 496.

(D.)—ASTEROIDEA.

Classification, history of Perrier's views since 1884, criticism of Viguier's and Sladen's schemes, the Euasteroidea are thus classified: Ord. I. *Forcipulata*, Famm. *Brisingidæ*, *Pedicellasteridæ*, *Zoroasteridæ*, *Stichasteridæ*, *Asteriidæ*; II. *Spinulosa*, Famm. *Echinasteridæ*, *Solasteridæ*, *Pterasteridæ*, *Asterinidæ*; III. *Valvulata*, Famm. *Linckiidæ*, *Pentagonasteridæ*; IV. *Paxillosa*, Famm. *Archasteridæ*, *Astropectinidæ*; PERRIER (263).

Defined (p. 496), classified (p. 502), in the following system (p. 504); HAECKEL (116):—

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Sub-class	Orders		
Palasteriæ (= Encrinasteriæ)	Hypomadrepia	Patrasterida	Patrasterida Palasteriscus Palæodiscus
	Epimadrepia	Palasterinida	Palasterinida Palasterina Palæocoma
Colasteriæ (= Autasteriæ)	Phanerozonia (= Eurystroteria)	Pentaceronia	Archasterida Porcellanasterida Astropectinida Pentagonasterida Pentacerotida Gymnasterida
		Asterisconia	Asterinida Asteriscida Ganerida
	Cryptozonia (= Leptostroteria)	Solasteronia	Solasterida Stichasterida Zoroasterida Pterasterida Heliasterida Echinasterida Urasterida
		Brisingonia	Brisingida Brisinga

Very short account of a few fossil forms, with figures after Stürtz; Koken (171) pp. 292, 294.—General account with special reference to fossils; Zittel (356) p. 170: revised by Sladen; Zittel-Eastman (357) p. 205.

Mediterranean, key to genera; Ludwig (209) p. 281.—General systematic results of study of Mediterranean spp., reduction from 81 names to 24 valid spp. in 14 genera; Ludwig (210) p. 450.

Acanthaster echinites, from Amboina, measured and described, probably includes *A. mauritiensis* Loriol; Doederlein (69) p. 320, pl. xxi.

Anasterias, accepted as genus, with genotype *A. minuta*; Perrier (263) pp. 32, 35.

Anthenea acuta, variation in form due to imperfect preservation; Whitelegge (346) p. 159.—*A. tuberculosa*, neanic specimen from Thursday Id.; Doederlein (69) p. 309.

Archaster typicus; Doederlein (69) p. 305.

Archasteridæ, rediagnosed; Perrier (263) p. 47.

Asteracanthion rubens; Dahl (62) p. 172.—*A. tenuispinus*, var. *elongatus* Lorenz. = *Asterias tenuispina*; Ludwig (210) p. 345.

Asterias, rediagnosed; Perrier (263) pp. 32, 34, 38: diagnosis, and key to Mediterranean spp.; Ludwig (209) p. 303: rediagnosed with special reference to Mediterranean genera and key to the 4 spp.; Ludwig (210) p. 344: how it opens molluscs; Schiemenz (295).—*A. africana* Greeff = *A. glacialis*; Ludwig (210) p. 365.—*A.* (*Sporasterias*) *antarctica* (p. 105, pl. vi), var. *rupicola*, measurements (p. 106, pl. vi); Meissner (229).—*A. atlantica* Verrill. = *A. tenuispina*?; Ludwig (210) p. 362.—+*A. cilicia*; Wagner (337) p. 100.—*A. conferta*, redescr. and now first figd; Loriol (196) p. 17, pl. iii.—*A. edmundi*, nom. nov. pro *Stolasterias neglecta* Perrier (non *A. neglecta* Bell), diagnosis; Ludwig (209) p. 306: synonymy, diagnosis, external description, measurements of old and young, colour, geogr. distrib., depth 160–485 m.; Ludwig (210) p. 395, pl. xii.—*A. epichlora*, redescr., and now first figd; Loriol (196) p. 19, pl. iii.—*A.* (*Stolasterias*) *gelatinosa*; Meissner (229) p. 103.—*A. glacialis*, colour; Marchisio (216) p. 2: diagnosis; Ludwig (209) p. 305: treated similarly to *A. edmundi*,

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also with bathymetric distrib., food, breeding-period, and regeneration; LUDWIG (210) p. 364, pls. iii, xii.—*A. gracilis* Giebel, syn. of *Craspidaster hesperus*; LUDWIG (210) pp. 60, 451.—*A. gronlandica, formæ typica et robusta*, measured; VANHOEFFEN (333) p. 236.—*A. heptactis* Konrad = *A. tenuispina* Lm.; LUDWIG (210) p. 344.—*A. hispidus* M. Tr., syn. of *A. pentacanthus*, var. *serratus* (q.v.); LUDWIG (210) p. 451.—*A. lutkeni*, redescr. and now first figd; LORIOL (196) p. 15, pl. ii.—*A. madeirensis* Stimps. = *A. glacialis*; LUDWIG (210) p. 364.—*A. ophidion*, relations to *A. richardi*; LUDWIG (210) p. 417.—*A. pallida*, development; GOTO (102).—*A. papyracea* Konrad = *Palmipes membranaceus*; LUDWIG (210) pp. 243, 452.—*A. polaris*; HONEYMAN (131) p. 255; VANHOEFFEN (333) p. 237: Azores; PERRIER (263) p. 38.—*A. richardi*, diagnosis; LUDWIG (209) p. 307: treated similarly to *A. edmundi*, also with bathymetric distrib., autotomy due to *Myrostoma*, systematic position discussed; LUDWIG (210) p. 403, pl. xii.—*A. rodolphi*, redescr. from Raoul Id. specimens, and distinguished from *A. scabra*; FARQUHAR (83).—*A. rubens*, Bay of Biscay; PERRIER (263) p. 38: recorded occurrences in Mediterranean all doubtful; LUDWIG (210) p. 345, footnote.—*A. rugispina* Leipoldt, is in part syn. of *A. antarctica*; MEISSNER (229) p. 94: formation of gonads confirms inclusion of *A. spirabilis, A. cunninghami, Anasterias minuta*, and probably *Calvasterias stolidota*, in this species; LEIPOLDT (186).—†*A. schulzii*, occurrence in Chlomeker Schichten doubtful; FRIČ (91) p. 72.—*A. spirabilis* Perr., is syn. of *A. antarctica*; MEISSNER (229) p. 106.—*A. squamatus* M. Tr., syn. of *A. jonstoni* (Della Chiaje); LUDWIG (210) p. 451.—*A. (Cosmasterias) sulcifera*; MEISSNER (229) p. 102.—*A. tenuispina*, colour; MARCHISIO (216) p. 2: diagnosis; LUDWIG (209) p. 304: treated similarly to *A. edmundi*, also with bathymetric distrib., breeding period, autotomy; LUDWIG (210) p. 344, pls. iii, xi.—*A. tenuissima* Risso, errore pro *A. tenuispina* = *Luidia ciliaris*; LUDWIG (210) pp. 61, 345, 451.—*A. tessellata*, see *Hippasterias phrygiana* and *Pentagonaster granularis*.—*A. variolata* Risso = *Hacelia attenuata*; LUDWIG (210) pp. 272, 452.—*A. verrucosa* Risso, = *Chætaster longipes*; LUDWIG (210) pp. 134, 451.—*A. vulgaris*; HONEYMAN (131) p. 255: pyloric cæca; STONE (321).

A. (*Polyasterias*) *fernandensis*, Juan Fernandez; MEISSNER (229), Arch. Naturg. (1) lxii, p. 104.—*A. koehleri*, Saanich Inlet (Vancouver); LORIOL (196) Mem. Soc. Geneve, xxxii, p. 21, pl. iii.—*A.* (*Coscinasterias*) *platei*, Juan Fernandez; MEISSNER (229) Arch. Naturg. (1) lxii, p. 103, pl. vi.—*A. saanichensis*, Saanich Inlet (Vancouver); LORIOL (196) Mem. Soc. Geneve, xxxii, p. 23, pl. ii : n. spp.

Asteriidæ, rediagnosed with synopsis of genera; PERRIER (263) p. 31.

Asterina, rediagnosed with special reference to Mediterranean genera; LUDWIG (210) p. 207, and (209) p. 296.—*A. calcar*, colour-variation; SAVILLE-KENT (290) p. 243.—*A. calcarata*, var. nov. *selkirki*, Juan Fernandez; MEISSNER (229) p. 97, pl. vi.—*A. cepheus*; PFEFFER (267) p. 47; DOEDERLEIN (69) p. 316.—*A. chilensis*, colour; MEISSNER (229) p. 96.—*A. fimbriata*; MEISSNER (229) p. 97.—*A. gibbosa*; MARCHISIO (216) p. 3: development, specially from gastrula to end of larval stage; MACBRIDE (212): with var. *pancerii*, diagnosis; LUDWIG (209) p. 297: synonymy includes *H. minuta* Olivi, *A. umbilicata* Konrad, *A. minima* Verany, *A. membranacea* Risso, *Asteriscus arrecifensis* Greeff, and *A. pancerii* Gasco; diagnoses, external description, measurements of old and young, colour, geogr. and bathymetric distrib., food, breeding period, anatomical notes; LUDWIG (210) pp. 207, 451, pls. v, ix.—*A. regularis*, variation in rays, madreporite, and spines, perhaps includes *A. novæ zelandiæ* Perrier; FARQUHAR (83) p. 196.—*A.* sp., colour-variation; SAVILLE-KENT (290) p. 243.

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Asterinidæ, rediagnosed; PERRIER (263) p. 42.

Asteropsis vernicina, irregularity in specialised pedicellariæ; FARQUHAR (83) p. 194.

A. imperialis, Raoul Id., Kermadecs; FARQUHAR (83) J. Linn. Soc. xxvi, p. 193 : n. sp.

Astrella simplex, see *Luidia sarsi*, brephic stage.

Astrogonium, rediagnosed; PERRIER (263) p. 44.—*A. annectens*; KOEHLER (163) p. 451, & (164) p. 57: Bay of Biscay; PERRIER (263) p. 45.—*A. pulchellum* var. *B.* of Hutton is perhaps *A. abnormale* Gray, perhaps *A. huttoni*, n. s.; FARQUHAR (83) p. 194.—†*A. sp.* ?, Pliocene of Piacentino; PRATO (271) p. 48, pl.

Astropecten, rediagnosed; PERRIER (263) p. 51: key to Mediterranean spp., and diagnosis; LUDWIG (209) p. 283: rediagnosed, with special reference to Mediterranean genera, and key to spp.; LUDWIG (210) p. 2: feeding on Molluscs; SCHIEMENZ (295).—*A. aurantiacus*, B. of Biscay; PERRIER (263) p. 51: diagnosis; LUDWIG (209) p. 284: synonymy, diagnosis, external description, measurements of old and young, colour, geogr. and bathymetric distrib., food, breeding-period; LUDWIG (210) p. 3, pls. ii, vi.—*A. bispinosus*; MARCHISIO (216) p. 3: diagnosis; LUDWIG (209) p. 284: and var. *platyacanthus*, treated similarly to *A. aurantiacus*; LUDWIG (210) p. 16, pls. ii, vi.—*A. brevior* Lorenz, merged in *A. pentacanthus* (q. v.); LUDWIG (210) p. 451.—*A. flanaticus* Lorenz, not upheld; LUDWIG (210) pp. 18, 451.—*A. gracilis* Giebel, supposed Mediterranean sp.= *Craspidaster hesperus*, known only from W. Pacific; LUDWIG (210) p. 60.—*A. granulatus*, measured; DOEDERLEIN (69) p. 305, pl. xviii.—*A. hemprichii*, colour; PFEFFER (267) p. 47.—*A. irregularis*; KOEHLER (164) p. 53: variation in spines; KOEHLER (163) p. 450: skiagram; MEEK (226).—*A. jonstoni*, diagnosis; LUDWIG (209) p. 286: treated similarly to *A. aurantiacus*; LUDWIG (210) p. 50, pls. ii, vi.—*A. jonstoni* M. Tr., syn. of *A. spinulosus* Philippi (q. v.); LUDWIG (210) p. 451.—*A. pentacanthus*; MARCHISIO (216) p. 3: diagnosis; LUDWIG (209) p. 285: treated similarly to *A. aurantiacus*; LUDWIG (210) p. 39, pls. ii, vi.—*A. platyacanthus*; MARCHISIO (216) p. 3: var. of *A. bispinosus* (q. v.); LUDWIG (210) p. 451.—*A. polyacanthus*, colour; PFEFFER (267) p. 47.—*A. serratus*, B. of Biscay; PERRIER (263) p. 51: described as var. of *A. pentacanthus* and held to include *A. hispidus*; LUDWIG (210) p. 47.—*A. spinulosus*, diagnosis; LUDWIG (209) p. 285: treated similarly to *A. aurantiacus*; LUDWIG (210) p. 31, pls. ii, vi.—*A. squamatus*, colour; MARCHISIO (216) p. 3: syn. of *A. jonstoni* (q. v.).—*A. velitaris*, measured; DOEDERLEIN (69) p. 307, pl. xviii.—*A. zebra* (includes *A. coppingeri* Bell), measured and described; DOEDERLEIN (69) p. 306, pl. xviii.—†*A.* sp. (cf. *A. forbesi* and *A. bispinosus*), Miocene of Gombio, Italy; PRATO (271) p. 43, pl.

†*A. linati*, Middle Pliocene, Piacentino and Parma district, locality uncertain; PRATO (271), Riv. ital. Pal. ii, p. 45, pl., n. sp.

Astropectinidæ, rediagnosed; PERRIER (263) p. 50.

Astropectininæ, rediagnosed; PERRIER (263) p. 51.

Brisinga, diagnosis; LUDWIG (209) p. 308: rediagnosed with special reference to Mediterranean genera; LUDWIG (210) p. 418: rediagnosed; PERRIER (263) p. 20.—*B. coronata*; KOEHLER (163) p. 440: redescr.; KOEHLER (164) p. 38: Azores; PERRIER (263) p. 20: diagnosis; LUDWIG (209) p. 308: (incl. *B. mediterranea* Perrier), diagnosis, literary history, external description, measurements of old and young, colour, geogr. and bathymetric distrib., food, breeding-period, regeneration; LUDWIG (210) p. 418.

Brisingidæ, rediagnosed; PERRIER (263) p. 19.

Bunaster, n. g. with genotype *B. ritteri*, Amboina, allied to *Ophi-*

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diaster; DOEDERLEIN (69) Denk. Ges. Jena, viii, p. 317, pl. xxii : n. sp.

Calvasterias, accepted as genus, with genotype *C. asterinoides*; PERRIER (263) pp. 32, 34.

Calycaster, rediagnosed; PERRIER (263) p. 27; *C. monœcus*, Azores, redescribed, 4 specimens of different ages; PERRIER (263) p. 28, pl. ii.

Chætaster, rediagnosed; PERRIER (263) p. 43: diagnosis; LUDWIG (209) p. 292: rediagnosed with special reference to Mediterranean genera (134), its systematic position discussed (p. 155); LUDWIG (210).—*C. longipes* Bruzelius, B. of Biscay; PERRIER (263) p. 44: redescr., referred to *Archasteridæ*; LUDWIG (202): diagnosis; LUDWIG (209) p. 292: synonymy, diagnosis, external description, measurements of old and young, colour, geogr. and bathymetric distrib., breeding-period; LUDWIG (210) p. 134, pls. i, ix.

Chætasteridæ, n. fam. provisional; LUDWIG (210) pp. 134, 156.

Coronaster antonii, variations from Perrier's type; KOEHLER (163) p. 440: redescribed; KOEHLER (164) p. 40.

Coscinasterias, accepted as genus, with genotype *C. calamaria*; PERRIER (263) p. 34.

Cosmasterias, accepted as genus, with genotype *C. sulcifera*; PERRIER (263) pp. 32, 35: vide etiam sub *Asterias*.

†*Crenaster lævis*; RAULIN (274).

Cribrella, rediagnosed; PERRIER (263) p. 39.—*C. hyadesi*, redescr.; MEISSNER (229) p. 99.—*C. læviuscula*, redescr. and now first figd.; LORIOL (196) p. 14, pl. ii.—*C. oculata*; KOEHLER (163) p. 444, & (164) p. 45; VANHOEFFEN (333) p. 237: Azores and Newfoundland; PERRIER (263) p. 39.—*C. oculata*, Russo, probably neanic *Echinaster sepositus*; LUDWIG (207) p. 112, & (210) pp. 314, 452.

C. biscayensis, B. of Biscay, 1410 metres, 6° 21′ W., 45° 57′ N., allied to *C. antillarum*; KOEHLER (163) Rev. biol. Nord France, vii, p. 444, & (164) Ann. Univ. Lyon, xxvi, p. 45, figg. 12 & 13.—*C. caudani*, B. of Biscay, 650 metres, 4° 25′ W., 44° 36′ N., allied to *C. oculata*; KOEHLER (163) Rev. biol. Nord France, vii, p. 445, & (164) Ann. Univ. Lyon, xxvi, p. 46, figg. 16 & 17 : n. spp.

Crossaster, rediagnosed; *C. papposus*, Newfoundland; PERRIER (263) p. 40.

C. vancouverensis, Saanich Inlet (Vancouver); LORIOL (196) Mem. Soc. Geneve, xxxii, p. 12, pl. i : n. sp.

Ctenodiscus corniculatus; VANHOEFFEN (333) p. 238.

Culcita acutispina, redescribed, variation in form due largely to imperfect preservation; WHITELEGGE (346) p. 157.—*C. coriacea*, defined (p. 316, pl. xxi); *C. grex*, defined (p. 316); *C. novæ-guineæ*, includes *C. plana* Hartlaub, which is the young form, also *C. acutispinosa* Bell, *C. arenosa* Perrier, *C. pentangularis* Gray, which are stages of growth or local varieties (p. 300, pl. xix); *C. schmideliana*, discussed and defined, with var. *ceylonica* and var. *africana* (p. 315, pl. xx); *C. veneris*, defined (p. 316); DOEDERLEIN (69).

Cycethra simplex, with forma *subelectilis*; MEISSNER (229) pp. 95 & 96.

†*Diclidaster*, n. g., allied to *Valvaster*, with genotype *D. gevreyi*, Lower Lias, Mercuer (Ardeche); LORIOL (195) Rev. Suisse Zool. v, p. 177, pl. viii, n. sp.

Distolasterias, genotype *D. sticantha* (Slad.); PERRIER (263).

Dorigona arenata; KOEHLER (163) p. 451, & (164) p. 57.—*D. jacqueti*, "paraît pouvoir être réunie à la *D. arenata*"; KOEHLER (163) p. 451: compared with *D. arenata*, intermediate forms; KOEHLER (164) p. 58.—*D. subspinosa*; KOEHLER (163) p. 451: redescr.; KOEHLER (164) p. 59.

Dytaster, rediagnosed and *D. intermedius*, Azores, redescribed; PERRIER (263) p. 48, pl. iii.

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Echinaster, diagnosis; LUDWIG (209): rediagnosed with special reference to Mediterranean genera; LUDWIG (210) p. 313.—*E. doriæ* and *E. tribulus* de Filippi, said to be from Mediterranean, are synn. of *E. spinosus*, and come from E. coast of America; LUDWIG (199), see also LUDWIG (208).—*E. eridanella*; DOEDERLEIN (69) p. 322.—*E. sepositus*, colour; MARCHISIO (216) p. 2: growth-stages; LUDWIG (207): diagnosis; LUDWIG (209) p. 302: synonymy, diagnosis, external description, measurements of old and young, colour, breeding period, development, geogr. and bathymetric distrib.; LUDWIG (210) p. 300, pls. iii, viii: var. *mediterraneus* not upheld; LUDWIG (210) p. 343.—*E. tribulus* = *E. doriæ* (q. v.); LUDWIG (208).

Echinasteridæ, rediagnosed; PERRIER (263) p. 39.

Encrinasteriæ, defined, fossil representatives; ZITTEL (356) p. 171; ZITTEL-EASTMAN (357) p. 207.

Euasteriæ, defined, includes *Phanerozonia* and *Cryptozonia*, fossil representatives; ZITTEL (356) p. 172; ZITTEL EASTMAN (357) p. 208.

†*Eugaster granifer*, Pilton Beds, Devonshire; WHIDBORNE (342) P. Geol. Ass. xiv, p. 377, no fig.: n. sp.

Ferdina kuhlii; PFEFFER (267) p. 47.

Forcipulata, rediagnosed; PERRIER (263) p. 19.

Ganeria falklandica, redescribed; MEISSNER (229) p. 94.

Gnathaster mediterraneus, v. *Odontaster*. *G. rugosus*, mouth-plates figured; FARQUHAR (83) p. 194.

†*Goniaster impressæ*; HUG (133) p. 405.

Goniodiscus acutus et *G. placentæformis*, Heller = *Pentagonaster placenta*; LUDWIG (210) pp. 157, 451.—*G. pleyadella*, large and small specimens described; DOEDERLEIN (69) p. 308, pl. xviii.—*G. sebae*; *op. cit.* p. 309.

Gymnasteria carinifera; DOEDERLEIN (69) p. 316.

Hacelia, diagnosis; LUDWIG (209) p. 299: rediagnosed with special reference to Mediterranean genera; LUDWIG (210) p. 271.—*H. attenuata*, diagnosis; LUDWIG (209) p. 300: synonymy, diagnosis, external description, measurements of old and young, colour, geogr. and bathymetric distrib., special description of brephic stage, anatomical notes; LUDWIG (210) p. 272, pls. iii, xi.

Heliaster; HARRINGTON & GRIFFIN (124).—*H. helianthus*; MEISSNER (229) p. 102.

Hexaster, rediagnosed; PERRIER (263) p. 41.—*H. obscurus*, Newfoundland, redescribed; PERRIER (263) p. 41, pl. iii.

Hippasterias phrygiana recorded, under name *Asterias tessellata*, from Lindisfarne; SUTTON (322) & DISTANT (67).

Hydrasterias, accepted as genus, genotype *H. ophidion*; PERRIER (263) pp. 32, 34.

Hymenaster rediagnosed, and *H. pellucidus*, Azores; PERRIER (263) p. 40.

Iconaster longimanus; DOEDERLEIN (69) p. 307, pl. xviii.

Labidiaster radiosus; MEISSNER (229) p. 101.

Leiaster coriaceus, colour; PFEFFER (267) p. 47.

Leptasterias, accepted as genus, with genotype *L. mülleri*; PERRIER (263) pp. 32, 34.

Linckia miliaris; DOEDERLEIN (69) p. 319.—*L. multifora*; *loc. cit.*; PFEFFER (267) p. 47.—*L. pacifica*; WHITELEGGE (346) p. 157.

Linckiidæ, rediagnosed; PERRIER (263) p. 43.

Luidia, rediagnosed; PERRIER (263) p. 52: diagnosis, key to Mediterranean species; LUDWIG (209) p. 286: rediagnosed, with special reference to Mediterranean genera, and key to the two species; LUDWIG (210) p. 61.—*L. bellonæ*, colour; MEISSNER (229) p. 93.—*L. ciliaris*, redescribed, variations of pedicellaria; KOEHLER (164) p. 50, & (163) p. 448: diagnosis; LUDWIG (209) p. 287: synonymy, diagnosis, measure-

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ments of old and young, external description, colour, geogr. and bathymetric distrib., food, breeding-period, special description of brephic stage, anatomical notes; LUDWIG (210) p. 61, pls. iv, vi: var. *normani*, given up; LUDWIG (210) p. 79.—*L. maculata*; DOEDERLEIN (69) p. 307.—*L. paucispina* Marenz., syn. of *L. sarsi*; LUDWIG (210) pp. 85, 86, 451.—*L. sarsi*; KOEHLER (163) p. 449, & (164) p. 51: Bay of Biscay; PERRIER (263) p. 52: diagnosis; LUDWIG (209) p. 288: treated similarly to *L. ciliaris*, also with description of larva, *Bipinnaria asterigera*; LUDWIG (210) p. 85, pls. iv, vii.

L. lorioli, based on *L. bellonæ* Loriol non Lütk., Mexico; MEISSNER (229) Arch. Naturg. (1) lxii, p. 94: n. sp.

Luidiinæ, rediagnosed; PERRIER (263) p. 51.

Marginaster, diagnosis; LUDWIG (209) p. 295: rediagnosed with special reference to Mediterranean genera; LUDWIG (210) p. 189.—*M. capreensis*, diagnosis; LUDWIG (209) p. 295: synonymy, diagnosis, external description, measurements of old and young, colour, geogr. and bathymetric distrib., stomach-cæca, gonads; LUDWIG (210) p. 189, pl. vii.—*M. fimbriatus* Sladen = *M. capreensis* (Gasco); LUDWIG (210) pp. 189, 451.

Marthasterias foliacea Jullien; LUDWIG (210) p. 365.

Mediaster, rediagnosed (p. 45); *M. stellatus*, Newfoundland, redescribed (p. 46, pl. iv); PERRIER (263).

Mithrodia clavigera; DOEDERLEIN (69) p. 322.

Myxaster perrieri, Bay of Biscay, 1300 metres, 5° 22′ W., 44° 2′ N.; KOEHLER (163) Rev. biol. Nord France, vii, p. 446, & (164) Ann. Univ. Lyon, xxvi, p. 48, fig. 11: n. sp.

Nanaster, n. g. with genotype *N.* (olim *Stichaster*) *albulus* Stimps; PERRIER (263) p. 27.

Nardoa tuberculata; DOEDERLEIN (69) p. 319.—*N. variolata*; PFEFFER (267) p. 47.

Neomorphaster, discussed (p. 26), rediagnosed (p. 30); PERRIER (263).—"*N. parfaiti*," errore pro *N. talismani*, redescr., incl. *N. eustichus*, first occurrence in B. of Biscay; KOEHLER (163) p. 443, & (164) p. 44.—*N. talismani*, Azores, incl. *N. eustichus*; PERRIER (263) p. 30.

Nepanthia brevis; DOEDERLEIN (69) p. 316.

Odinia robusta; KOEHLER (163) p. 440, & (164) p. 40.

Odontaster, diagnosis; LUDWIG (209) p. 290: rediagnosed with special reference to Mediterranean genera; LUDWIG (210) p. 125.—*O. mediterraneus*, diagnosis; LUDWIG (209) p. 291: diagnosis, external description, measurements of old and young, S. Adriatic, 414–1196 m.; LUDWIG (210) p. 125.—*O. meridionalis*, measurements; MEISSNER (229) p. 93.—*O. singularis*, measurements; *op. cit.* p. 92, pl. vi.

Ophidiaster, rediagnosed; PERRIER (263) p. 43: diagnosis; LUDWIG (209) p. 300: rediagnosed with special reference to Mediterranean genera; LUDWIG (210) p. 299.—*O. agassizi*; MEISSNER (229) p. 99.—*O. canariensis* Greeff = *O. ophidianus* (Lm); LUDWIG (210) pp. 300, 452.—*O. cylindricus*, Funafuti; WHITELEGGE (346) p. 157.—†*O. lessonæ* Gasco, is half-grown *O. attenuatus*; LUDWIG (203) p. 56, & (210) pp. 272, 452.—*O. ophidianus*, colour; MARCHISIO (216) p. 3: Azores; PERRIER (263) p. 44: diagnosis; LUDWIG (209) p. 301: synonymy, diagnosis, external description, measurements of old and young, colour, geogr. and bathymetric distrib., anatomical notes; LUDWIG (210) p. 300, pls. iii, viii.—*O. pustulatus* includes *O. purpureus*, Perrier; DOEDERLEIN (69) p. 317.—*O. tuberifer*; *loc. cit.*—*O.* sp., Kermadec Is., described; FARQUHAR (63) p. 195.

Oreaster reticulata; DUERDEN (77) p. 285.

†*Palæaster*:—*P. parviusculus*; HONEYMAN (131) p. 255.—*P. wykoffi*, Hudson River group, near Madison, Ind.; MILLER & GURLEY (235): "Einord-

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nung zur *Palæaster* höchst zweifelhaft"; LUDWIG.—17 spp. of Cincinnati group redescr.; JAMES (146) pp. 126–133.

P. longimanus, Pilton Beds, Devonshire; WHIDBORNE (342) P. Geol. Ass. xiv, p. 376, no fig. : n. sp.

†*Palasterina approximata* & *P. speciosa* refd to *Palæaster*; JAMES (146) p. 135.

Palmipes, rediagnosed; PERRIER (263) p. 42: rediagnosed with special reference to Mediterranean genera; LUDWIG (209) p. 298 & (210) p. 243.—*P. lobianci* = *P. membranaceus* × *Asterina gibbosa*, 90 m., Grotto of Capri, external description, gonads, interbrachial septa; LUDWIG (210) p. 267, pl. v.—*P. membranaceus*; KOEHLER (163) p. 446, and (164) p. 47: B. of Biscay; PERRIER (263) p. 42: synonymy, diagnosis, external description, measurements of old and young, colour, geogr. and bathymetric distrib., food, breeding-period, anatomical notes; LUDWIG (210) p. 243, pls. v, viii: diagnosis, with bastard *P. lobianci*; LUDWIG (209) p. 298.—*P.*, sp., colour-variation; SAVILLE-KENT (290) p. 243.

P. sarasini, Trincomali (Ceylon), allied to *P. pellucidus*; LORIOL (196) Mem. Soc. Geneve, xxxii, p. 11, pl. i: n. sp.

Pararchasterinæ, rediagnosed; PERRIER (263) p. 47.

Paxillosa, rediagnosed; PERRIER (263) p. 47.

Pedicellaster, rediagnosed (p. 20); *P. parvulus*, Newfoundland, redescribed (p. 21); PERRIER (263).

Pedicellasteridæ, rediagnosed; PERRIER (263) p. 20.

Pentaceropsis obtusatus; DOEDERLEIN (69) p. 310.

Pentaceros grayi; PFEFFER (267) p. 47.—*P. muricatus*, colour; *loc. cit.*—*P. turritus*; DOEDERLEIN (69) p. 309.

Pentagonaster, rediagnosed; PERRIER (263) p. 45: diagnosis and key to Mediterranean spp.; LUDWIG (209) p. 293: rediagnosed with special reference to Mediterranean genera, and key to the two spp.; LUDWIG (210) p. 157.—*P. australis*, colour-variation; SAVILLE-KENT (290) p. 243.—*P. balteatus* and *P. concinnus* of Sladen, possibly identical with *P. hystricis*; LUDWIG (203) p. 55, and (210) pp. 186 & 187.—*P. crassus*, B. of Biscay; PERRIER (263) p. 45.—*P. gosselini*, Azores, five variations in marginals and adambulacral spines; *loc. cit.*—*P. granularis*; SUTTON (322): Azores; PERRIER (263) p. 45: specific characters discussed, Bell's (1892) description criticised; LUDWIG (210) p. 180, footnote.—*P. greeni* Bell, ? syn. of *P. hystricis*; *op. cit.* p. 185.—*P. hystricis*, diagnosis; LUDWIG (209) p. 294: synonymy, diagnosis, external description, measurements of old and young, colour, geogr. and bathymetric distrib.; LUDWIG (210) p. 179, pl. viii.—*P. mirabilis* Perrier = *P. placenta*; *op. cit.* pp. 176, 451.—*P. perrieri*; KOEHLER (163) p. 451, and (164) p. 60.—*P. placenta*, diagnosis; LUDWIG (209) p. 294: treated similarly to *P. hystricis*, also with anatomical notes; LUDWIG (210) p. 157, pls. v, vii: first found in B. of Biscay, growth-stages of madreporite; KOEHLER (163) p. 454, and (164) p. 66.

P. kergroheni, 1710 metres, B. of Biscay, 6° 52′ W., 46° 34′ N., allied to *P. concinnus*, *P. balteatus*, and *P. hystricis*; KOEHLER (163) Rev. biol. Nord France, vii, p. 453, and (164) Ann. Univ. Lyon, xxvi, p. 63, figg. 8–10: syn. of *P. hystricis*; LUDWIG (203) p. 55, and (210) pp. 179, 188.—*P. minor*, 400–500 metres, B. of Biscay, 6° 58′ W., 46° 40′ N.; KOEHLER (163) Rev. biol. Nord France, vii, p. 451, and (164) Ann. Univ. Lyon, xxvi, p. 61, figg. 5–7: young of *P. placenta*; LUDWIG (203) p. 55, and (210) p. 176 : n. spp.

Pentagonasteridæ, rediagnosed; PERRIER (263) p. 44.

†*Petraster* & *P. wilberanus*; JAMES (146) p. 134.

Plutonaster, rediagnosed; PERRIER (263) p. 48: diagnosis, key to Mediterranean spp.; LUDWIG (209) p. 288: rediagnosed, with special reference to Mediterranean genera, and key to the two spp.; LUDWIG (210)

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p. 104.—*P. bifrons*; KOEHLER (163) p. 450, and (164) p. 56: diagnosis; LUDWIG (209) p. 290: diagnosis, external description, measurements of old and young, colour, geogr. and bathymetric distrib.; LUDWIG (210) p. 118.—*P. granulosus*, Azores, redescribed (p. 49, pl. iv); *P. inermis* (p. 49); *P. notatus*, Azores (p. 49); PERRIER (263).—*P. subinermis*; diagnosis; LUDWIG (209) p. 288: treated similarly to *P. bifrons*, also food, description of brephic stage, anatomical notes, systematic position discussed; LUDWIG (210) p. 105, pls. i, vi.

Plutonasterinæ, rediagnosed; PERRIER (263) p. 47.

Podasterias, with genotype *P. lutkeni*; PERRIER (263) p. 35.

Polyasterias, genotype *P. tenuispina* (Lam.); PERRIER (263) p. 34: vide etiam sub *Asterias*.

Pontaster, rediagnosed, and *P. limbatus*, Newfoundland; PERRIER (263) p. 47.—*P. marionis*; KOEHLER (163) p. 450: probably var. of *P. tenuispinus*; KOEHLER (164) p. 53.—*P. venustus*; KOEHLER (163) p. 450: some variations from the type; KOEHLER (164) p. 55: Azores; PERRIER (263) p. 47.

Porania, rediagnosed; PERRIER (263) p. 42.—*P. antarctica*; *loc. cit.* and pl. iii, fig. 4; MEISSNER (229) p. 99.—*P. pulvillus*; KOEHLER (163) p. 446, and (164) p. 47: Bay of Biscay; PERRIER (263) p. 43.

Prognaster, rediagnosed and discussed; PERRIER (263) p. 22.—*P. grimaldii*, Azores, redescribed; *op. cit.* p. 23, pl. ii.

Psilaster, rediagnosed; PERRIER (263) p. 51.—*P. andromeda*, Azores; *loc. cit.*: redescribed; KOEHLER (164) p. 52: variation in spines, gradation between paxillæ and granules; KOEHLER (163) p. 449.

Pteraster personatus, variation from type; KOEHLER (163) p. 447: redescribed, differences from type; KOEHLER (164) p. 49.

Pterasteridæ, rediagnosed; PERRIER (263) p. 40.

Pycnopodia, accepted as genus, with genotype *P. helianthoides* (Stimps.); PERRIER (263) pp. 32, 34.

Quadraster, n. g. with genotype *Q.* (olim *Stichaster*) *felipes* Sladen; PERRIER (263) p. 27.

Retaster cribrosus, includes *R. insignis* Sladen, specimens from Thursday Island and Dar-es-Salaam described; DOEDERLEIN (69) p. 319.

Sclerasterias, rediagnosed; PERRIER (263) pp. 34 & 35.—*S. guernei*, Bay of Biscay, redescribed; *op. cit.* p. 35, pl. i: specimens larger than Perrier's type; KOEHLER (163) p. 441: redescribed; KOEHLER (164) p. 41.

Smilasterias, accepted as genus, with genotype *S. scalptrifera*; PERRIER (263) pp. 32, 34.

Solaster papposus, 10- and 12-rayed, measurements; VANHOEFFEN (333) p. 238.

Solasteridæ, rediagnosed; PERRIER (263) p. 39.

Spinulosa, rediagnosed; PERRIER (263) p. 38.

Sporasterias, with genotype *S. rugispina* (Stimps.); PERRIER (263) p. 34: vide etiam sub *Asterias*.

Stellaster incei, measurements of nine specimens, includes *S. belcheri*; DOEDERLEIN (69) p. 307.

Stellonia webbiana d'Orb. = *Asterias glacialis*; LUDWIG (210) p. 364.

†*Stenaster* (incl. *Urasterella*), *S. grandis*, *S. harrisi*; JAMES (146) pp. 135, 136.

Stichaster, defined and emended; PERRIER (263) pp. 26, 31.—*S. albulus*; VANHOEFFEN (333) p. 237.—*S. aurantiacus*; MEISSNER (229) p. 101.—*S. littoralis* Farq. is syn. of *S. suteri* Loriol, colour-difference due to alcohol, variation in shape of rays (p. 197); *S. polyplax*, includes *Tarsaster neozelanicus* Farq. (p. 196); FARQUHAR (83).—*S. roseus*; KOEHLER (163) p. 443, and (164) p. 44: B. of Biscay; PERRIER (263) p. 31.

Stichasteridæ, rediagnosed, and its genera discussed; PERRIER (263) p. 25.

Stolasterias, emend. as genus; PERRIER (263) pp. 32, 34, 36: vide etiam sub *Asterias*.—*S. glacialis*; KOEHLER (163) p. 441, and (164) p. 41.—

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S. neglecta, B. of Biscay, redescr.; PERRIER (263) p. 37, pl. i: vide etiam *Asterias edmundi*.—*S. madeirensis*, Azores; PERRIER (263) p. 37.

†*Tæniaster*, maintained as genus of Asteroidea, with genotype *T. spinosus*; GREGORY (111) p. 1035.—†*T.*? sp.; WHITEAVES (344) p. 160.

Tarsaster, merged in *Neomorphaster*; PERRIER (263) p. 26.—*T. neo-zelanicus* Farquhar, though probably a *Tarsaster*, is syn. of *Stichaster polyplax*; FARQUHAR (83) p. 196.

Tethyaster, rediagnosed; PERRIER (263) p. 50.—*T. subinermis*, in B. of Biscay; KOEHLER (163) p. 450, & (164) p. 56, and PERRIER (263) p. 50.

Tonia Gray, 1840, resuscitated with genotype *T.* (vel *Stichaster*) *aurantiaca*; PERRIER (263) p. 27.

Uniophora, accepted as genus, with genotype *U. globifera*: PERRIER (263) pp. 32, 35.

†*Uraster rubens*; BELL (33) p. 12.

†*Urasterella*, vide sub *Stenaster*.

Valvulata, rediagnosed; PERRIER (263) p. 43.

Zoroaster fulgens; KOEHLER (163) p. 442, and (164) p. 42.

Z. trispinosus, 650 metres, Bay of Biscay, 4° 25′ W., 44° 36′ N., adult, also marine specimen from 1750 metres, 7° W., 46° 28′ N.; KOEHLER (163) Rev. biol. Nord France, vii, p. 442, and (164) Ann. Univ. Lyon, xxvi, p. 42, figg. 14 & 15 : n. sp.

Zoroasteridæ, rediagnosed; PERRIER (263) p. 21.

(E.)—OPHIUROIDEA.

Ophiodea (= *Ophiuroidea*) defined (p. 487), classified (p. 494) into Sub-cl. I. *Palophiuræ*, Ord. 1, *Allostichia* (*Protophiurida*), 2, *Zygostichia* (*Ophiurinida*); Sub-cl. II, *Colophiuræ*, Ord. 3, *Ophioctonia* (*Ophioglyphida*, *Ophiocomida*, *Ophiomyxida*), 4, *Euryalonia* (*Astroporpida*, *Astrophytida*); system on p. 504; HAECKEL (116).

General account with special reference to fossils; ZITTEL (356) p. 166, ZITTEL-EASTMAN (357) p. 200.

Classification of Palæozoic Ophiuroidea; GREGORY (111).

†?*Acroura* sp.; WAGNER (337) p. 100.

†*Aganaster*, maintained but not rediagnosed (p. 1039): *A.* sp., Miller & Gurley, 1890, is not an *Aganaster* but allied to *Lapworthura* (p. 1038); GREGORY (111).

Amphilepis norvegica; KOEHLER (164) p. 74.

Amphiura angularis; KOEHLER (166) p. 244.—*A. chiajei*; KOEHLER (165) p. 209, and (166) p. 243.—*A. duplicata*; KOEHLER (165) p. 208, and (166) p. 244: variations in buccal papillæ; KOEHLER (164) p. 74.—*A. elegans*, small var., near Gisborne, N. Z., colour in life; FARQUHAR (83) p. 191.—*A. filiformis*; KOEHLER (165) p. 209, and (166) p. 244: colour; MARCHISIO (216) p. 4.—*A. squamata*; KOEHLER (165) p. 212: development of ovoid gland (p. 378), currents of madreporite (p. 381), right hydrocœl in (p. 391); MACBRIDE (212).—*A. sundevalli*, measurements; VANHOEFFEN (333) p. 240.

A. brocki, Thursday Id.; DOEDERLEIN (68) Denk. Ges. Jena, viii, p. 286, pl. xv.—*A. caulleryi*, off Colombo, 593 fms.; Mouth of the Krishna, 753 fms., allied to *A. incisa*; KOEHLER (169) Ann. Sci. nat. iv, p. 330, pl. vii.—*A. denticulata*, 155 metres, off Newfoundland, 46° 50′ N., 50° 11′ 45″ W.; KOEHLER (165) Mem. Soc. zool. France, ix, p. 209.—*A. dispar*, Laccadive Is., G. of Bengal, and Colombo, 193–675 fathoms; KOEHLER (169) Ann. Sci. nat. iv, p. 334, pl. vii.—*A. frigida*, off Colombo, 675 fathoms, allied to *A. incisa* and *A. caulleryi*; *op. cit.* p. 332, pl. vii.—*A. grandis*, 2620 metres, 38° 38′ N., 30° 33′ W.; KOEHLER (166) Mem. Soc. zool. France, ix, p. 246.—*A. longispina*,

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861 metres, Azores, 38° 48′ N., 30° 19′ W., allied to *A. grandisquama*; KOEHLER (165) Mem. Soc. zool. France, ix, p. 211, (164) p. 74, and (166) p. 244.—*A. partita*, Laccadive Is., 444 metres, allied to *A. duplicata*; KOEHLER (169) Ann. Sci. nat. iv, p. 336, pl. vii.—*A. pusilla*, among roots of *Lessonia* and *Macrocystis*, Wellington, N. Z.; FARQUHAR (83) J. Linn. Soc. xxvi, p. 191.—*A. richardi*, 1165 metres, 38° 26′ N., 28° 51′ W., N. Atlantic; KOEHLER (166) Mem. Soc. zool. France, ix, p. 245 : n. spp.

†*Aspidura*:—*A. ludeni*; WAGNER (337) p. 100.

A. italica, Muschelkalk, Recoaro; CREMA (59) Atti Ist. Veneto, liv, p. 855, pl. iia : n. sp.

Astronyx loveni, KOEHLER (169) p. 370.

A. locardi, Bay of Biscay, 1710 metres, 7° W., 46° 28′ N.; KOEHLER (163) Rev. biol. Nord France, vii, p. 470, and (164) Ann. Univ. Lyon, xxvi, p. 88, fig. 25 : n. sp.

Astrophyton agassizi; HONEYMAN (131) p. 254.—*A. clavatum*; PFEFFER (267) p. 48.

A. sculptum, Amboina; DOEDERLEIN (68) Denk. Ges. Jena, viii, p. 299, pl. xviii : n. sp.

Brisinga endecacnemos first found near Bergen; APPELLÖF (13) p. 4.

†*Bundenbachia*, rediagnosed; GREGORY (111) p. 1033.

†*Cholaster* Worthen & Miller, allied to *Aganaster*; GREGORY (111) p. 1040.

†*Eoluvidiдæ*, n. fam., founded for *Eoluvidia*, which is redefined, and *Eospondylus*, *Miospondylus*, and *Aganaster* (qq. v.); GREGORY (111) p. 1038.

†*Eospondylus*, n. g., with genotype *E.* (olim *Ophiura*) *primigenia* (Stürtz); GREGORY (111) P. Zool. Soc. London, 1896, p. 1039.

†*Eucladiidæ*, defined, and *Eucladia*, arms described and figured, referred to *Streptophiuræ*; GREGORY (111) p. 1040.

†*Eugaster*, rediagnosed from Hall's figures; GREGORY (111) p. 1035.

Euryale ludwigi, Amboina; DOEDERLEIN (68) Denk. Ges. Jena, viii, p. 299, pl. xvii : n. sp.

Euryaleæ, defined, fossil representatives; ZITTEL (356) p. 168.

†*Furcaster*, rediagnosed, has no ventral arm-plates; GREGORY (111) p. 1038.

Gorgonocephalus eucnemis; KOEHLER (165) p. 213; VANHOEFFEN (333) p. 241.

Gorgonocephalus cornutus, imperfect description, Indian Ocean; KOEHLER (167) Zool. Anz. xx, p. 168: Andaman Is., 45–270 fathoms, neanic specimen; KOEHLER (169) Ann. Sci. nat. iv, p. 368, pl. ix.—*G. levigatus*, imperfect description, Indian Ocean; KOEHLER (167) Zool. Anz. xx, p. 168: Colombo, 142–400 fathoms; KOEHLER (169) Ann. Sci. nat. iv, p. 365, pl. ix : n. spp.

†*Lapworthura miltoni*; GREGORY (112) p. 97, fig. 154.

†*Lapworthuridæ*, n. fam., including *Lapworthura*, n. g., with genotype *L.* (olim *Protaster*) *miltoni* (Salter), also *Furcaster*, *Palastropecten*, and *Aganaster* sp. (qq. v); GREGORY (111) p. 1037.

†*Lysophiuræ*, ord. nov.; GREGORY (111) p. 1030.

†*Miospondylus*, n. g., with genotype *M.* (olim *Ophiura*) *rhenanus* (Stürtz); GREGORY (111) P. Zool. Soc. London, 1896, p. 1039.

†*Onychasteridæ*, defined; GREGORY (111) p. 1040.

Ophiacantha abyssicola; KOEHLER (163) p. 463, (164) p. 79, and (165) p. 213.—*O. bidentata*; KOEHLER (163) p. 463, (164) p. 79, and (165) p. 212; VANHOEFFEN (333) p. 241.—*O. dallasi*, from Amboina, described; DOEDERLEIN (68) p. 291, pls. xiv, xvi.—*O. rosea*, variations from type; KOEHLER (163) p. 463, and (164) p. 81.—*O. setosa*; KOEHLER (165) p. 212.—*O. spectabilis*, redescribed, from Bay of Biscay; KOEHLER (163) p. 464, and (164) p. 80, figg. 41 & 42.

Ophiacantha aristata, Bay of Biscay, 1700 metres, 6° 15′ W., 45° 47′ N., allied to *O. aspera*; KOEHLER (163) Rev. biol. Nord France, vii,

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p. 467, (164) Ann. Univ. Lyon, xxvi, p. 84, figg. 43 & 44, and (165) p. 212.—*O. composita*, Nicobar Is., 1590 fms., allied to *O. levispina*; KOEHLER (169) Ann. Sci. nat. iv, p. 350, pl. viii.—*O. duplex*, Colombo, 675 fms., allied to *O. imago*; *op. cit.* p. 352, pl. viii.—*O. gratiosa*, Laccadive Is., 444 fms., Andaman Is., 240 fms., G. of Bengal, 193 fms., allied to *O. abnormis*; *op. cit.* p. 346, pl. viii.—*O. lineata*, 1165 metres, 38° 26′ N., 28° 51′ W., allied to *O. aristata*; KOEHLER (166) Mem. Soc. zool. France, ix, p. 247.—*O. pentagona*, Andaman Is., 240–375 fms., allied to *O. stellata*; KOEHLER (169) Ann. Sci. nat. iv, p. 342, pl. viii.—*O. rufescens*, 845 metres, 38° 31′ N., 29° 9′ W.; KOEHLER (166) Mem. Soc. zool. France, ix, p. 249.—*O. simulans*, Bay of Biscay, 1700 metres, 6° 15′ W., 45° 47′ N., allied to *O. bidentata*; KOEHLER (163) Rev. biol. Nord France, vii, p. 465, and (164) Ann. Univ. Lyon, xxvi, p. 82, figg. 37 & 38.—*O. sociabilis*, Andaman Is., 1840 fms., G. of Bengal, 1803 fms., allied to *O. discoidea*; KOEHLER (169) Ann. Sci. nat. iv, p. 348, pl. viii.—*O. vestita*, Coast of Coromandel, 195–210 fms., and Andaman Is., 250 fms., allied to *O. hirsuta*; *op. cit.* p. 344, pl. viii.—*O. vorax*, C. Comorin, 1043 fms., allied to *O. longidens*; *op. cit.* p. 353, pl. viii : n. spp.

Ophiactis abyssicola, KOEHLER (165) p. 208, (166) p. 243.—*O. balli*; KOEHLER (165) p. 208: redescribed; KOEHLER (164) p. 77, figg. 23 & 24 : redescribed and figured, from Bay of Biscay; KOEHLER (163) p. 461.—*O. modesta*, from Thursday Id., one young with an abnormal 6th ray, relations to *O. affinis* and *O. maculosa*; DOEDERLEIN (68) p. 285, pls. xiv & xv.—*O. savignii*; PFEFFER (267) p. 47.

O. corallicola, 950–1710 metres, various stations, Bay of Biscay, on corals *Amphihelia oculata*, allied to *O. cuspidata*; KOEHLER (163) Rev. biol. Nord France, vii, p. 460, and (164) Ann. Univ. Lyon, xxvi, p. 75, fig. 30: near Azores; KOEHLER (165) p. 208: see also KOEHLER (166) p. 243.—*O. lorioli*, G. of Bengal, Laccadive Is., and coast of Malabar, 1091–1300 fms.; KOEHLER (169) Ann. Sci. nat. iv, p. 328, pl. vii.—*O. perplexa*, W. of C. Comorin, 719 fms., allied to *O. flexuosa*; *op. cit.* p. 327, pl. vii : n. spp.

Ophiarthrum elegans; DOEDERLEIN (68) p. 289: Funafuti; WHITELEGGE (346) p. 160.

Ophiermus adspersus, variations from type; KOEHLER (169) p. 316.

O. abyssalis, 1674 m., off La Corogne; KOEHLER (166) Mem. Soc. zool. France, ix, p. 2: n. sp.

Ophiocamax fasciculata, variations from type; KOEHLER (169) Ann. Sci. nat. iv, p. 360.

Ophioceramis tenera, nom. nud.; KOEHLER (167) p. 168: Laccadive Is., 636 fms., Andaman Is., 265 fms., allied to *O. obstricta*; KOEHLER (169) Ann. Sci. nat. iv, p. 317: n. sp.

Ophiochæta hirsuta (=*O. setosa*), from Amboina; DOEDERLEIN (68) p. 284, pl. xv.

Ophiochiton ambulator, nom. nud.; KOEHLER (167) p. 168: Laccadive and Maldive Is., G. of Bengal, Trincomali, and coast of Beloochistan, at depths varying from 200 to 890 fms., allied to *O. fastigatus*; KOEHLER (169) Ann. Sci. nat. iv, p. 337, pl. vii.—*O. modestus*, Andaman Is., 265 fms., type is neanic, allied to *O. tenuispinus*; *op. cit.* p. 340, pl. vii : n. spp.

Ophiocnida:—†*O. brachiata*; BELL (33) p. 11.

O. verticillata, Amboina; DOEDERLEIN (68) Denk. Ges. Jena, viii, p. 287, pls. xiv & xv : n. sp.

Ophiocoma:—†*O. bellis*; BELL (33) p. 11.—*O. brevipes*, Amboina; DOEDERLEIN (68) p. 289.—*O. erinaceus*; PFEFFER (267) p. 48; WHITELEGGE (346) p. 160: made var. of *O. scolopendrina*; DOEDERLEIN (68) p. 289.—*O. nigra*; SUTTON (322).—†*O. rosula*; BELL (33) p. 11.—*O.*

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scolopendrina; PFEFFER (267) p. 48; WHITELEGGE (346) p. 160: var. *alternans*; DOEDERLEIN (68) p. 288.—*O. valenciæ*; PFEFFER (267) p. 48.

Ophioconis forbesi; KOEHLER (165) p. 213.

O. indica, Andaman Is., 45–270 fms.; KOEHLER (169) Ann. Sci. nat. iv, p. 325, pl. vii: n. sp.

Ophiocreas(?) E. of Andaman Is., 1644 fms., imperfect specimen; KOEHLER (169) Ann. Sci. nat. iv, p. 365: n. sp. sine nom.

Ophiocten sericeum, measurements; VANHOEFFEN (333) p. 240.

O. le-dantsci, Bay of Biscay, 1700 metres, 6° 58′ W., 46° 26′ N., allied to *O. amitimum*; KOEHLER (163) Rev. biol. Nord France, vii, p. 458, and (164) Ann. Univ. Lyon, xxvi, p. 72.—*O. longispinum*, 1850 metres, N. of Azores, 40° 5′ N., 29° 48′ W.; KOEHLER (165) Mem. Soc. zool. France, ix, p. 204, and (166) p. 243.—*O. scutatum*, 160 metres, Bay of Biscay, 45° 48′ N., 5° 38′ W., also from Banc de la Grand Sole and Newfoundland, allied to *O. abyssicola*; KOEHLER (165) Mem. Soc. zool. France, ix, p. 206 : n. spp.

Ophioderma:—†*O.* (*Ophiarachna*) ? *hauchecornei*; WAGNER (337) p. 100.—*O. longicauda*, colour; MARCHISIO (216) p. 3.

Ophioglypha abyssorum; KOEHLER (166) p. 241.—*O. æqualis*, redescr., compared with *O. lepida*; KOEHLER (169) p. 297, pl. vi.—*O. albida*; KOEHLER (163) p. 458, (164) p. 71, and (165) p. 203: parasitic *Dactylococcus*; MORTENSEN (244) p. 322.—*O. carnea*; KOEHLER (165) p. 203, and (166) p. 241.—*O. flagellata*, slight variations from type; KOEHLER (169) p. 299.—*O. imbecillis*, very young; KOEHLER (169) p. 303.—*O. irrorata*; KOEHLER (166) p. 241: redescr.; KOEHLER (164) p. 67: redescr. and figd. from B. of Biscay; KOEHLER (163) p. 455.—*O. lacertosa*, colour; MARCHISIO (216) p. 3.—*O. ljungmanni*; KOEHLER (164) p. 71.—*O. minuta*; KOEHLER (163) p. 458, & (166) p. 242: redescr.; KOEHLER (164) p. 72.—*O. orbiculata*, compared with *O. irrorata* (p. 302); *O. palliata*, Maldive Is., slight variation in tentacular scales (p. 298); *O. radiata* (p. 300); KOEHLER (169).—*O. robusta*; HONEYMAN (131) p. 254.—*O. sarsi*; KOEHLER (165) p. 203: large individuals only found; VANHOEFFEN (333) p. 239.—*O. sculptilis*, variations from type; KOEHLER (169) p. 301.—*O. sinensis*, var. from Amboina; DOEDERLEIN (68) p. 283, pl. xv.—*O. tessellata*, KOEHLER (165) p. 203.—*O. texturata*; KOEHLER (163) p. 458, (164) p. 71, and (165) p. 203: parasitic *Dactylococcus* (p. 322), growth-stages (p. 321); MORTENSEN (244).—*O. undulata*, slight variations from type; KOEHLER (169) p. 299.

O. inflata, off Colombo, 597 fms., allied to *O. tenera* Lyman; KOEHLER (169) Ann. Sci. nat. iv, p. 288, pl. v.—*O. involuta*, G. of Bengal, 1748 fms., allied to *O. irrorata* and *O. orbiculata*; *op. cit.* p. 295, pl. vi.—*O. paupera*, Laccadive Is., 705 fms., and coast of Malabar, 406 fms., allied to *O. convexa*; *op. cit.* p. 290, pl. v.—*O. sordida*, Andaman Is., 561 fms., allied to *O. paupera*; *op. cit.* p. 292, pl. v.—*O. thouleti*, B. of Biscay, 1300 m., 5° 22′ W., 44° 2′ N., allied to *O. ljungmanni* and *O. palliata*; KOEHLER (163) Rev. biol. Nord France, vii, p. 456, (164) Ann. Univ. Lyon, xxvi, p. 69, figg. 39 & 40, and (166) p. 241: n. spp.

Ophiolepis annulosa; DOEDERLEIN (68) p. 283.—†*O.* (*Haploaster*) *gracilis*; BELL (33) p. 11.

Ophiolypus granulatus, nom. nud.; KOEHLER (167) p. 168: Port Blair (Andaman Is.) 112 fms.; KOEHLER (169) Ann. Sci. nat. iv, p. 315, pl. vi : n. sp.

Ophiomastix annulosa (p. 289, pl. xvi); *O. asperula*, redescr. (p. 290, pl. xv); *O. caryophyllata*, redescr. (p. 290, pl. xv); DOEDERLEIN (68).—*O. venosa*; PFEFFER (267) p. 48.

Ophiomastus tumidus, nom. nud.; KOEHLER (167) p. 167: G. of Bengal, 1310 fms., compared with *O. tegulitus* and *O. secundus*; KOEHLER (169) Ann. Sci. nat. iv, p. 285, pl. v : n. sp.

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Ophiomaza cacaotica, colour; DOEDERLEIN (68) p. 298, pl. xvii.

Ophiomitra cordifera, 1143 metres, 38° 52′ N., 30° 26′ W.; KOEHLER (166) Mem. Soc. zool. France, ix, p. 250.—*O. globulifera*, Bay of Biscay, 1700 metres, 6° 15′ W., 45° 57′ N.; KOEHLER (163) Rev. biol. Nord France, vii, p. 469, and (164) Ann. Univ. Lyon, xxvi, p. 86, figg. 28 & 29.—*O. integra*, Andaman Is., 220–240 fms., allied to *O. valida*; KOEHLER (169) Ann. Sci. nat. iv, p. 356, pl. ix.—*O. rudis*, Andaman Is., 780 fms., allied to *O. incisa*, *O. chelys*, and *O. dipsacos*; *op. cit.* p. 358, pl. ix : n. spp.

Ophiomusium lymani; KOEHLER (163) p. 458, (164) p. 72, (165) p. 204, and (166) p. 242.—*O. planum*; KOEHLER (166) p. 242, and (169) p. 308.—*O. scalare*, redescribed from specimens more adult than type; *op. cit.* p. 308, pl. vi.—*O. validum*, variation from Lyman's description; *op. cit.* p. 307.

O. elegans, Laccadive Is., 406 fms., and Andaman Is., 490 fms., allied to *O. eburneum*; KOEHLER (169) Ann. Sci. nat. iv, p. 305, pl. vi.—*O. familiare*, Laccadive Is., 406 fms., allied to *O. eburneum*; *op. cit.* p. 303, pl. vi : n. spp.

Ophiomyxa australis; PFEFFER (267) p. 48.—*O. brevispina*, with parasitic gastropod, ? *Stylifer*; DOEDERLEIN (68) p. 298, pl. xvii.—*O. pentagona*, colour; MARCHISIO (216) p. 4.

O. bengalensis, Andaman Is., 173–250 fms., allied to *O. serpentaria*; KOEHLER (169) Ann. Sci. nat. iv, p. 363, pl. ix: n. sp.

†*Ophiopege* G. Boehm, syn. of *Aganaster*; GREGORY (111) p. 1040.

Ophiopeza conjungens, redescr.; DOEDERLEIN (68) p. 281, pl. xv.—*O. cylindrica*, descr. and figd; FARQUHAR (83) p. 190.—*O. fallax*, colour; PFEFFER (267) p. 47.

O. custos, Andaman Is., 45–270 fms.; KOEHLER (169) Ann. Sci. nat. iv, p. 321, pl. vi.—*O. danbyi*, Raoul Id., Kermadecs, the few, large arm-spines involve rediagnosis of genus; FARQUHAR (83) J. Linn. Soc. xxvi, p. 190 : n. spp.

O. aculeata; KOEHLER (165) p. 208; HONEYMAN (131) p. 254: measurements; VANHOEFFEN (333) p. 241.

Ophiopleura borealis; VANHOEFFEN (333) p. 239.

Ophioplocus imbricatus; PFEFFER (267) p. 47; DOEDERLEIN (68) p. 283.

Ophiopsila sp., crowded in sand; MITSUKURI & HARA (241).

Ophiopteris antipodium, Nelson, N. Z.; FARQUHAR (83) p. 192.

Ophiopyren bispinosus, Indian Ocean; KOEHLER (167) Zool. Anz. xx, p. 167: Andaman Is., 240–250 fms., compared with *O. brevispinus* and *O. longispinus*; KOEHLER (169) Ann. Sci. nat. iv, p. 312, pl. vi: n. sp.

Ophiopyrgus alcocki, nom. nud.; KOEHLER (167) p. 167: G. of Bengal, 1310 fms.; KOEHLER (169) Ann. Sci. nat. iv, p. 283, pl. v : n. sp.

Ophioscolex retectus, Bay of Biscay, 1410 metres, 6° 21′ W., 45° 57′ N.; KOEHLER (163) Rev. biol. Nord France, vii, p. 462, and (164) Ann. Univ. Lyon, xxvi, p. 78, fig. 31: n. sp.

Ophiothela danæ, remarks, a specimen with 3 arms atrophied; DOEDERLEIN (68) p. 297, pl. xvii.

Ophiothrix alopecurus; MARCHISIO (216) p. 4.—*O. aristulata*, n. var. *investigatoris*, Andamans and coast of Coromandel, 130–290 fms.; KOEHLER (169) Ann. Sci. nat. iv, p. 361, pl. ix.—*O. bedoti*, additional notes; DOEDERLEIN (68) p. 294, pls. xiv, xvi.—*O. fragilis*; KOEHLER (163) p. 470, (164) p. 88, (165) p. 213, and (166) p. 253; MARCHISIO (216) p. 4: development, movements of larva; ZIEGLER (355) p. 136.—*O. hirsuta*; PFEFFER (267) p. 48.—*O. longipeda*, measured (p. 293, pls. xiv, xvi); *O. martensi*, redescr. (p. 291, pls. xiv, xvi); *O. nereidina*, incl. *O. cataphracta* Martens (p. 293, pl. xvi); *O. punctolimbata*, perhaps = *O. longipeda juv.* (p. 294, pls. xiv, xvi); *O. purpurea*, redescr. (p. 296, pls. xiv, xvii); *O. stelligera* (p. 294, pls. xiv, xvi),

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O. striolata, descr. (p. 295, pls. xiv, xvii); *O. triloba*, Amboina (p. 293, pl. xvi); DOEDERLEIN (68).—†*O.* sp.; BELL (33) p. 11.

O. belli, Thursday Id.; DOEDERLEIN (68) Denk. Ges. Jena, viii, p. 292, pls. xiv, xvi.—*O. investigatoris*, nom. nud.; KOEHLER (167) p. 168.—*O. lorioli*, Amboina; DOEDERLEIN (68) Denk. Ges. Jena, viii, p. 297, pls. xiv, xvii.—*O. vitrea*, Amboina; *op. cit.* p. 295, pls. xiv, xvi: n. spp.

Ophiotrema, n. g., with genotype *O. alberti*, 4020 metres, 38° 9′ N., 25° 36′ W., possibly congeneric with *Ophiacantha bartleti* Lyman; KOEHLER (166) Mem. Soc. zool. France, ix, p. 251; n. sp.

Ophiotriton, n. g., with genotype *O. semoni*, Thursday Id.; DOEDERLEIN (68) Denk. Ges. Jena, viii, p. 288, pl. xv: n. sp.

Ophiotrochus panniculus; KOEHLER (169) p. 312.

Ophiotypa, n. g., with genotype *O. simplex*, Indian Ocean and Azores; KOEHLER (167) Zool. Anz. xx, p. 167: G. of Bengal, 1997 fms.; KOEHLER (169) Ann. Sci. nat. iv, p. 281, pl. v: n. sp.

Ophiozona bispinosa, nom. nud.; KOEHLER (167) p. 168: Port Blair (Andaman Is.), 112 fms., allied to *O. tessellata*; KOEHLER (169) Ann. Sci. nat. iv, p. 319, pl. vi: n. sp.

Ophiura:—†*O. albida*; BELL (33) p. 11.—*O. granulata*, see *Ophiocoma nigra*.—†*O. prisca*; WAGNER (337) p. 100.—†*O. texturata*; BELL (33) p. 11.

O. annæ, 570 fms., 44° 38′ N., 54° 6′ W., Grand Bank, N. Atlantic, has 6 rays; HONEYMAN (132) P. Nova Scotian Inst. vii, p. 265: n. sp.

Ophiureæ, defined, fossil representatives; ZITTEL (356) p. 169.

†*Ophiurinidæ* and *Ophiurina*, rediagnosed; GREGORY (111) p. 1036.

†*Palæophiuridæ*, defined, and *Palæophiura*, rediagnosed; GREGORY (111) p. 1034.

†*Palastropecten*, rediagnosed; GREGORY (111) p. 1038.

Pectinura arenosa, redescribed; DOEDERLEIN (68) p. 282, pl. xv.—*P. heros*; KOEHLER (169) Ann. Sci. nat. iv, p. 325.—*P. maculata*, New Zealand, colour in life; FARQUHAR (83) p. 190.—*P. rigida*; PFEFFER (267) p. 47.—*P. septemspinosa*, specimen with divided dorsal plates, relations to *P. rigida* and *P. armata* discussed; DOEDERLEIN (68) p. 282.

P. conspicua, nom. nud., size only given; KOEHLER (167) p. 168: Delta of the Godavery, 410 fms., allied to *P. heros*; KOEHLER (169) Ann. Sci. nat. iv, p. 322, pl. vii: n. sp.

†*Protaster*, rediagnosed; GREGORY (111) p. 1031; JAMES (146) p. 137.—*P. daoulasensis* Davy, allied to *Furcaster*; GREGORY (111) p. 1038.—*P. decheni*, vide *Tremataster*. *P. ? granuliferus* & *P. miamiensis*; JAMES (146) p. 138.

P. biforis, Wenlock Shale, Castle Dinas, Bran, near Llangollen, Wales; GREGORY (111) P. Zool. Soc. London, 1896, pp. 1032 & 1033.—*P. gregarius*, *P. perarmatus*, and *P. scabrosus*, all Pilton Beds, Devonshire; WHIDBORNE (342) P. Geol. Assoc. xiv, p. 377, no figg.: n. spp.

†*Protasteridæ*, redefined; GREGORY (111) p. 1031.

†*Protasterina*, *P. fimbriata*, & *P. flexuosa* (olim *Protaster*); JAMES (146) pp. 139, 140.

†*Ptilonaster*, maintained but not diagnosed; GREGORY (111) p. 1036.

†*Streptophiuræ*, redefined; GREGORY (111) p. 1036.

†*Sturtzura*, n. g., with genotype *S.* (olim *Protaster*) *brisingoides* (Greg.), and including *Protaster leptosoma* Salter; GREGORY (111) P. Zool. Soc. London, 1896, p. 1034.

†*Tæniaster* & *T. elegans*; JAMES (146) pp. 138, 139.

†*Tæniura*, n. g., with genotype *T.* (olim *Tæniaster*) *cylindricus* (E. Bill.); GREGORY (111) P. Zool. Soc. London, 1896, p. 1035. [*Tæniura* preocc. Müller & Henle 1837, Raiadum genus.]

†*Tremataster*, rediagnosed with genotype *T. difficilis*, and probably including *Protaster decheni*; GREGORY (111) p. 1037.

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(F.)—CRINOIDEA.

Defined (p. 462), classified (p. 468): Subcl. I *Palacrinida*, Ord. 1, *Cystodiata* (*Haplocrinida*, *Coccocrinida*, *Stephanocrinida*, *Pisocrinida*, *Hybocrinida*, *Porocrinida*, *Cupressocrinida*), 2, *Camerata* (*Retecrinida*, *Rhodocrinida*, *Glyptocrinida*, *Melocrinida*, *Actinocrinida*, *Platycrinida*, *Crotalocrinida*, *Barrandocrinida*, *Hexacrinida*, *Acrocrinida*, *Calyptocrinida*), 3, *Flexilata* (*Taxocrinida*, *Ichthyocrinida*, *Uintacrinida*, *Thaumatocrinida*), 4, *Inadunata* (*Poteriocrinida*, *Cyathocrinida*, *Dendrocrinida*, *Decadocrinida*, *Astylocrinida*); Subcl. II, *Neocrinida*, Ord. 5, *Pelvicata* (*Encrinida*, *Apiocrinida*, *Eugeniacrinida*. *Holopida*, *Hyocrinida*, *Plicatocrinida*, *Saccocomida*, *Marsupitida*), 6, *Canalicata* (*Bathycrinida*, *Rhizocrinida*, *Pentacrinida*, *Comatulida*, *Actinometrida*); HAECKEL (116).—History of name (pp. 12 et sqq.); classification, history of previous attempts (pp. 11–31); value of the group, the name *Pelmatozoa*, principles of division (pp. 144 et sqq.); *Crinoidea* divided into Order 1, *Inadunata*, Suborders *Larviformia* and *Fistulata*; 2, *Camerata*, Typical Section and Nontypical Section; 3, *Articulata*, suborders *Impinnata* and *Pinnata* (p. 169); WACHSMUTH & SPRINGER (336).

Family, generic, and specific characters in *Crin.* (p. 153); species, criteria of (p. 155); colour of fossil *Crin.* as a systematic character (p. 227); WACHSMUTH & SPRINGER (336).

Crinoidea, name supplants *Eucrinoidea* formerly used by Zittel, general account with special reference to fossils; divided into Orders, *Larviformia*, *Camarata*, *Fistulata*, *Flexibilia*, *Articulata*; ZITTEL (356) p. 113.—Classification of Wachsmuth and Springer (336) adopted in part; ZITTEL-EASTMAN (357) pp. 134–175.

Tabular synopsis of Mesozoic and Palæozoic genera; KOKEN (171) p. 277.

†Crinoid fragments *Incertæ sedis* from Cornwall; COLLINS (54) p. 82, pl. E.

Acacocrinus, subg. n., vide sub *Habrocrinus*.

†*Acrochordocrinus*,—*A.*, cf. *amalthei*, Bajocian, Caucasus; FOURNIER (85) p. 110.—[Vide etiam sub *Cyclocrinus*.]

†*Acrocrinidæ*, redefined, distribution of species; WACHSMUTH & SPRINGER (336) p. 803.

†*Acrocrinus*, rediagnosed (p. 505), arms (p. 86); *A. shumardi*, redescr., incl *A. urnæformis* Hall (p. 806, pl. lxxx), *A. wortheni*, redescr. (p. 807, pl. lxxx); WACHSMUTH & SPRINGER (336).

A. amphora, St. Louis group, near Huntsville, Ala.; WACHSMUTH & SPRINGER (336) p. 808, pl. lxxx; n. sp.

†*Actinocrinidæ*, defined, includes *Briarocr.*, *Patelliocr.*, *Macrostylocr.*, *Carpocr.*, *Leptocr.*, *Desmidocr.*, *Periechocr.*, *Megistocr.*, *Agaricocr.*, *Actinocr.*, *Teleiocr.*, *Steganocr.*, *Physetocr.*, *Strotocr.*, *Eretmocr.*, *Amphoracr.*, *Batocr.*, *Dorycr.*; ZITTEL (356) p. 128: arrangement follows Wachsmuth & Springer (336); ZITTEL-EASTMAN (357) p. 141: N. American spp. discussed, their geological history; MILLER & GURLEY (234) p. 73: defined, analysis and distribution of genera (p. 550), anals (p. 130), arm-structure (p. 85); WACHSMUTH & SPRINGER (336).

Actinocrinoidea T. & T. Austin; WACHSMUTH & SPRINGER (336) p. 16.

†*Actinocrinus*, rediagnosed and descr., much restricted, incl. *Blairocr.* S. A. Miller (p. 552), arms (p. 85), orals (p. 94), tegmen (p. 108), pores (p. 122); WACHSMUTH & SPRINGER (336).—*A. ægilops* Hall, = *Teleiocr. umbrosus* (p. 628); *A. amplus* M. & W. = *Periechocr. whitei* (p. 530); *A. arrosus* (olim *Blairocr.*) S. A. Miller, redescr., incl. *B. bullatus* S. A. M. (p. 377, pl. lv); *A. asperrimus*, redescr. (p. 575, pl. lx); *A. blairi* S. A. Miller = *Cactocr. glans* (p. 625); *A. brevi-*

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cornis Hall = *Megistocr. evansi* (p. 535); *A. caroli* Hall, possibly syn. of *Dizygocrinus unionensis* (p. 425); (?) *A. chouteauensis*, redescr. (p. 570, pl. xlvi); *A. christyi* Hall non Shum. = *Periechocr. whitfieldi* (p. 522); *A. divosus* Hall = *Teleiocr. rudis* (p. 630); *A. dalyanus* S. A. Miller = *Cactocr. proboscidalis* (p. 601); *A. daphne*, redescr. (p. 574, pl. lvi); *A. decornis* Hall = *Dorycr. cornigerus* (p. 458); *A. delicatus* M. & W. = *Teleiocr. umbrosus* (p. 628); *A. divaricatus* Hall = *Dorycr. cornigerus* (p. 458); *A. (Calathocr.) erodus* Hall = *Teleiocr. rudis* (p. 630); *A. eryx* Hall = *Cactocr. glans* (p. 625); *A. excerptus* Hall = *Cactocr. proboscidalis* (p. 601); WACHSMUTH & SPRINGER (336). —*A. icosidactylus*, redescr., from La Varville; JULIEN (151) p. 135, pl. v.—*A. inflatus* Hall = *Amphoracr. spinobrachiatus* (p. 591); *A. infrequens* Hall = *Cactocr. thalia* (p. 604); *A. (Calathocr.) insculptus* Hall = *Teleiocr. rudis* (p. 630); *A. jugosus*, redescr. (p. 563, pl. liv); *A. lagena* Hall = *Cactocr. proboscidalis* (p. 601), *A. lobatus*, redescr., incl. ? *A. unicarinatus* Hall (p. 557, pls. lii, liv, lv); *A. locellus* Hall = *Cactocr. reticulatus* (p. 605); *A. lowei*, redescr., incl. *A. brontes* Hall (p. 562, pl. liv); *A. minor* Hall = *Megistocr. evansi* (p. 535); *A. multicornus* Lyon, syn. of *Centrocrinus pentaspinus* (p. 309); *A. multiradiatus*, tegmen (p. 109), redescr. (p. 555, pl. lii); *A. nodosus* S. A. Miller = *Cactocr. thalia* (p. 604); WACHSMUTH & SPRINGER (336).—*A. ovatus* Hall, vide *Cactocr. reticulatus*, var. *ovatus*.—*A. pendens* Hall = *Dorycr. unicornis* (p. 468); *A. penicillus* M. & W., an juveris *Teleiocr. adolescens* (p. 635); *A. pernodosus*, redescr. (p. 561, pl. lv); *A. planobasilis* Hall = *Amphoracr. divergens* (p. 588); *A. puteatus* Rowley & Hare = *Cactocr. lucina* (p. 603); *A. quadrispinus* White = *Amphoracr. divergens* (p. 588); *A. quaternarius* Hall = *Cactocr. proboscidalis* (p. 601); *A. quinquangularis*, ridges on tegmen (p. 118); WACHSMUTH & SPRINGER (336).—*A. retiarius*, made type of n. g. *Clematocrinus*; JAEKEL (144) p. 47.—*A. scitulus*, redescr., incl. *A. rusticus* Hall, *A. sillimani* M. & W., & *A. wachsmuthi* White (p. 559, pl. lv); *A. securus* Hall = *Cactocr. thetis* (p. 614); *A. stellaris*, tegmen (p. 109); *A. subumbrosus* Hall = *Teleiocr. liratus* (p. 633); *A. superlatus* Hall = *Megistocr. evansi* (p. 535); *A. symmetricus* Hall = *Aorocr. parvus* (p. 477); *A. tenuisculptus*, redescr., incl. *A. chloris* Hall (p. 571, pl. lv); *A. themis* Hall = *Cactocr. proboscidalis* (p. 601); *A. thoas* Hall = *Cactocr. reticulatus* (p. 605); *A. tholus* Hall = *Cactocr. glans* (p. 625); WACHSMUTH & SPRINGER (336).—*A. triacontadactylus*, redescr., from La Varville; JULIEN (151) p. 136, pl. v.—*A. trijugis* (olim *Blairocr.*) S. A. Miller, redescr. (p. 576, pl. liv); *A. trinodus* Hall = *Dorycr. unispinus* (p. 467); *A. urnæformis* McChesney = *Macrocr. koninckii* (p. 447); *A. validus* M. & W. = *Steganocr. concinnus* (p. 582); *A. verrucosus*, redescr., incl. *A. asterias* McChesney (p. 558, pl. lii); WACHSMUTH & SPRINGER (336).

A. batheri, Pilton Beds, Devonshire; WHIDBORNE (342) P. Geol. Ass. xiv, p. 377, no fig.—*A. bischoffi*, Burlington Group, Burlington, Iowa; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 8, pl. iii.—*A. gracilis*, Lower Burlington Limest., Burlington, Ia.; WACHSMUTH & SPRINGER (336) p. 572, pl. lvi.—*A. griffithi*, Upper part of Upper Burlington Limest., Burlington, Ia., and Pleasant Grove, Ia.; *op. cit.*, p. 568, pl. lii.—*A. jessiæ*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 32, pl. ii.—*A. magnificus*, Keokuk group, Indian Creek, Montgomery Co., Ind., incl. *A. lobatus* Worthen non Hall; WACHSMUTH & SPRINGER (336) p. 567, pl. liii.—*A. multiramosus*, Keokuk group, Indian Creek, Montgomery Co., and Canton, Washington Co., Ind. (an incl. *A. grandis* S. A. Miller non Lyon); *op. cit.* p. 564, pls. liii, lv.—*A. pallubrum*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 26, pl. i.

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—*A. pettisensis*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 6, pl. i.—*A. porteri*, Pilton Beds, Devonshire; WHIDBORNE (342) P. Geol. Ass. xiv, p. 377, no fig. — *A. sampsoni*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 5, pl. i.—*A. senectus*, Chouteau limestone, Sedalia, Mo.; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 36, pl. ii.—*A. sobrinus*, Burlington Group, Burlington, Ia.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 10, pl. iii.—*A. spectabilis*, *ibid.*; *op. cit.* p. 9, pl. iii.—*A. subpulchellus*, *ibid.*; *op. cit.* p. 13, pl. iii.—*A. subscitulus*, *ibid.*; *op. cit.* p. 12, pl. iii.—*A. tuberculosus*, Upper Burlington Limest., Burlington and Pleasant Grove, Ia.; WACHSMUTH & SPRINGER (336) p. 573, pl. lii: n spp.

Actinoidea C. F. Roem.; WACHSMUTH & SPRINGER (336) p. 16.

Actinometra pulchella, in B. of Biscay, variation in position of 1st syzygy, and of others; KOEHLER (163) p. 477, & (164) p. 99.

†*Adelocrinus hystrix*; WHIDBORNE (342) p. 377.

†*Agaricocrinus*, rediagnosed (p. 486), radial dome plates (p. 104); WACHSMUTH & SPRINGER (336): geological history of N. American spp.; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 9.—*A. americanus*, with var. *tuberosus*, redescr., incl. *A. dissimilis* S. A. Miller (p. 488, pls. xl, xlii); *A. bellatrema* (=*ornatrema*), redescr. (p. 506, pl. xli), var. nov. *major*, Upper Burlington Limest., Burlington and Pleasant Grove, Ia. (p. 507, pl. xli); *A. brevis*, redescr., incl. *A. corniculus* Hall (p. 511, pl. xxxviii); *A. bullatus*, redescr., incl. *A. pentagonus* Hall (p. 493, pl. xli); *A. convexus*, redescr., distinct from *A. pentagonus* (p. 508, pl. xxxviii); *A. coreyi*, redescr., incl. *A. springeri* White (p. 510, pl. xxxix); *A. crassus*, redescr. (p. 499, pls. xxxix & xl); *A. elegans*, redescr. (p. 500, pl. xl); *A. excavatus*, redescr. (p. 491, pl. xxxix); *A. fiscellus*, redescr. (p. 512, pl. xxxviii); *A. gracilis*, redescr. (p. 513, p. xli); *A. inflatus*, redescr. (p. 502, pl. xli); *A. nodosus*, redescr. (p. 493, pl. xliii); *A. noduloscus*, with var. *macadamsi*, redescr. (p. 497, pls. xxxix, xl, xliii); *A. planoconvexus*, redescr., incl. *A. decornis* Rowley & Hare, et *A. blairi* S. A. Miller (p. 503, pl. xxxviii); *A. pyramidatus*, redescr., incl. *A. corrugatus* Hall (p. 512, pl. xxxviii); *A. sampsoni*, redescr., incl. *A. germanus* et *A. chouteauensis* S. A. Miller (p. 505, pl. xlvi); *A. splendens*, redescr., incl. *A. indianensis* et *A. gorbyi* S. A. Miller (p. 495, pl. xl); *A. stellatus*, redescr., incl. *A. geometricus* Hall (p. 508, pl. xxxviii); *A. whitfieldi*, redescr. (p. 496, pls. xlii & xliii); *A. wortheni*, redescr. (p. 490, pls. xxxix & xl); WACHSMUTH & SPRINGER (336).

A. adamsensis, Burlington Group, Adams Co., Ill.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 24, pl. i.—*A. conicus*, Keokuk group, Indian creek, Montgomery Co., Ind., 3 arms with cysts of ?*Myzostoma*; WACHSMUTH & SPRINGER (336) p. 501, pl. xxxix.—*A. hodgsoni*, Burlington Group, Adams Co., Ill.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 23, pl. i.—*A. illinoisensis*, *ibid.*; *op. cit.* p. 25, pl. i.—*A. iowensis*, Keokuk group, Keokuk, Ia.; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 5, pl. i.—*A. keokukensis*, *ibid.*; *op. cit.* p. 7, pl. i : n. spp.

†*Agassizocrinidæ*, defined; ZITTEL-EASTMAN (357) p. 162.

†*Agassizocrinus*, chambered organ (p. 45), base (p. 59); WACHSMUTH & SPRINGER (336).

A. ovalis, Kaskaskia Group, Randolph Co., Ill.; MILLER & GURLEY (233), Bull. Illinois Mus. ix, p. 36, pl. ii : n. sp.

†*Agriocrinus*, discussed, syn. of *Hapalocrinus*, q. v.; BATHER (30) p. 343.

†*Allagecrinidæ*, defined, includes only *Allagecrinus*; ZITTEL-EASTMAN (357) p. 135.

†*Allagecrinus*, arm-branching (p. 78), muscle-plates (p. 87), orals (pp. 89, 92); WACHSMUTH & SPRINGER (336).

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†*Allionia* Michelotti, is syn. of *Antedon*; Loriol (194) p. 123.

†*Allocrinus*, rediagnosed (p. 306); *A. benedicti*, redescr. (p. 308, pl. xxiv), *A. typus*, redescr. (p. 307, pl. xxiv); Wachsmuth & Springer (336).

†*Alloprosallocrinus*, rediagnosed (p. 406); *A. cornicus*, redescr. (p. 407, pl. xlii); *A. depressus*, probably an *Agaricocrinus* (p. 407); Wachsmuth & Springer (336).

†*Amblacrinus*; Bather (30) p. 341.

†*Amphoracrinus*, rediagnosed & described (p. 586), arms (p. 85); Wachsmuth & Springer (336).—*A. americanus*, Quenst. Handb. Petrefactenk., Aufl. 3, pl. lxxvii, f. 7, non Roemer = *Agaricocr. wortheni* Hall (p. 488); *A. divergens*, redescr., incl. *Actinocr. planobasilis* Hall, *A. quadrispinus* White, and var. *multiramosus* M. & W. (p. 588, pl. lxii); *A. spinobrachiatus*, redescr., incl. *Actinocr. inflatus* Hall (p. 591, pl. lxii); *A. viminalis*, redescr. (p. 590, pl. liv); Wachsmuth & Springer (336).

A. blairi, Burlington Group, Sedalia, Mo.; Miller & Gurley (232) Bull. Illinois Mus. viii, p. 26, pl. i.—*A. jessieæ*, Chouteau limestone, Sedalia, Mo.; Miller & Gurley (234) Bull. Illinois Mus. x, p. 21, pl. iii.—*A. sampsoni*, *ibid.*; Miller & Gurley (232) Bull. Illinois Mus. viii, p. 27, pl. i : n. spp.

†*Ancyrocrinus*, what it is; Wachsmuth & Springer (336) p. 50.

†*Anisocrinus*, arm-branching; Wachsmuth & Springer (336) p. 77.

†*Anomalocrinidæ*, defined; Zittel-Eastman (357) p. 152.

†*Anomalocrinus*, stem (p. 40), base (p. 57), compound radials (pp. 71, 158), arm-branching (p. 78), tegmen (p. 116), anals (p. 127); Wachsmuth & Springer (336).

†*Anthemocrinus*, arm-branching; Wachsmuth & Springer (336) pp. 77.

Antedon, base (pp. 64, 68), development of arms (p. 82), orals (p. 99), anal (p. 139); Wachsmuth & Springer (336).—*A. bifida*, locomotion; Bather (26) p. 301, & (29) p. 664: vide etiam *A. rosacea*.—†*A. brownii*, and †*A. ransomei*; Bell (33) p. 6.—†*A. rhodanicus*, incl. *A. speciosus* Pomel, redescr. with variations in centrodorsal, Upper Burdigalian, compared with *A. lenticularis*; Loriol (194) p. 121, pl. iv.—*A. rosacea*; Marchisio (216) p. 1: vide etiam *A. bifida*.—†*A. woodwardi*; Bell (33) p. 6.—*A.* sp., 75 fathoms, La Have Banks; Honeyman (131) p. 253.—†*A.* sp.; Kilian (157) p. 721.

†*A. allardi*, Upper Burdigalian, Les Angles, near Avignon, compared with *A. globosus*; Loriol (194) Bull. Soc. geol. France (3), xxv, p. 126, pl. iv.—†*A. anglesensis*, *ibid.*; *tom. cit.* p. 121, pl. iv.—†*A. depereti*, *ibid.*, compared with *Allionia oblita*, *Antedon lineatus*, *A. cartennensis*, and *A. solutus*; *op. cit.* p. 125, pl. iv.—*A. flava*, B. of Biscay, 1410 m., 6° 21′ W., 45° 57′ N., belongs to *granulifera* group; Koehler (163) Rev. biol. Nord France, vii, p. 475, & (164) Ann. Univ. Lyon, xxvi, p. 97, figg. 20 & 21.—†*A. fontanesi*, Upper Burdigalian, Les Angles, near Avignon, compared with *A. meneghianus*; Loriol (194) Bull. Soc. geol. France (3), xxv, p. 126, pl. iv.—*A. moræ*, 570 fms., 44° 38′ N., 54° 6′ W., Grand Bank, N. Atlantic; Honeyman (132) P. Nova Scotian Inst. vii, p. 265.—†*A. pellati*, Upper Burdigalian, Les Angles, near Avignon; Loriol (194) Bull. Soc. geol. France (3), xxv, p. 125, pl. iv : n. spp.

†*Aorocrinus*, n. g. with genotype *A. immaturus* [syn. ac *Cœlocrinus*]; Wachsmuth & Springer (336) p. 470.—*A. canaliculatus* (olim *Dorycr.*) M. & W., redescr. (p. 475, pl. xlv); *A. cassedayi* (olim *Actinocr.* et *Gennæocr.*) Lyon, redescr., incl. ? *Actinocr. cauliculus* et *A. calypso* Hall (p. 483, pl. xlii); *A. concavus* (olim *Actinocr.*, *Amphoracr.*, *Cœlocr.* [Typ.], et *Dorycr.*) M. & W., redescr. (p. 482, pl. xlii); *A. elegans* (olim *Dorycr.*) S. A. Miller, redescr. (p. 480, pl. xxxiv); *A. helice* (olim *Actinocr.* et *Agaricocr.*) Hall, redescr., incl. var. *eris* Hall

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(p. 481, pl. xlv); *A. immaturus* (olim *Dorycr.*) W. & Sp., redescr. (p. 471), *A. parvibasis* (olim *Dorycr.*) W. & Sp., redescr. (p. 473, pl. xlv); *A. parvus* (olim *Actinocr.* et *Dorycr.*) Shum., redescr., incl. *A. symmetricus* Hall, et *D. amœnus* S. A. Miller (p. 477, pl. xlv); *A. radiatus* (olim *Dorycr.*) W. & Sp., redescr. (p. 472, pl. xlv); *A. spinosulus* (olim *Actinocr.* et *Dorycr.*) Hall, redescr., incl. *D. kelloggi* Worthen (p. 478, pl. xliii); *A. subaculeatus* (olim *Actinocr.* et *Dorycr.*) Hall, redescr. (p. 476, pl. xlv); WACHSMUTH & SPRINGER (336).

Apiocrinidæ, defined, includes *Apiocr.*, *Guettardocr.*, *Millericr.*, *Acrochordocr.*, *Calamocr.*; ZITTEL (356) p. 140; ZITTEL-EASTMAN (357) p. 167.

†*Apiocrinus*, base (pp. 60 & 61), tegmen (p. 117); WACHSMUTH & SPRINGER (336).—*A. meriani*, Tithonian, Bas-Languedoc; ROMAN (281) pp. 88, 331.—*A. milleri*; SCHLUETER (298) p. 496.—*A. polycyphus*?; HUG (133) p. 404.

A. recubariensis, Muschelkalk, Recoaro; CREMA (59) Atti Ist. Veneto, liv, p. 858, pl. ii: is a primitive *Millericrinus*; BATHER (27): n. sp.

†*Archæocrinus*, rediagnosed (p. 253); *A. desideratus*, redescr. (p. 257, pl. x); *A. lacunosus*, redescr. (p. 255, pl. x); *A. microbasalis*, redescr. (p. 256, pl. x); *A. marginatus* Bill., sp. referred back to *Glyptocrinus* (p. 254); *A. pyriformis* [errore pro *piriformis*], redescr. (p. 255, pl. x); WACHSMUTH & SPRINGER (336).

†*Aristocrinus*, validity of genus doubted; BATHER (24) p. 998.

†*Arthracantha*, rediagnosed, incl. *Hystricrinus* Hinde, validity of name and value of spines discussed; WACHSMUTH & SPRINGER (336) p. 747.—*A. ithacensis*; KINDLE (161) p. 33: redescr.; WACHSMUTH & SPRINGER (336) p. 749, pl. lxxvi.—*A. punctobrachiata*, redescr., incl. *Hystricrinus carpenteri* Hinde; *op. cit.* p. 750, pl. lxxvi.

A. depressa, Lower Chemung group, Steuben Co., N.Y.; WACHSMUTH & SPRINGER (336) p. 751, pl. lxxvi: n. sp.

Articulata (=*Neocrinoidea*, P. H. Carp., *Canaliculata*, W. & Sp., *Pentacrinacea*, Neum.), defined, includes families *Encrinidæ*, *Apiocrinidæ*, *Bourgueticrinidæ*, *Eugeniacrinidæ*, *Holopidæ*, *Plicatocrinidæ*, *Saccocomidæ*, *Pentacrinidæ*, *Comatulidæ*; ZITTEL (356) p. 139; ZITTEL-EASTMAN (357) p. 165: sensu Joh. Müller (p. 15), sensu J. S. Miller (p. 13), sensu W. & Sp. (p. 26), redefined (pp. 149, 151), sensu Zittel (pp. 23 & 24); WACHSMUTH & SPRINGER (336).

Articulosa, nom. nov. pro *Articulata* sensu W. & Sp. non Müll.; WACHSMUTH & SPRINGER (336) p. 153.

†*Ascocrinus* vel *Ascocystis*, vide sub IV G.

†*Astrocrinus* Conrad, syn. of *Melocrinus*; WACHSMUTH & SPRINGER (336) p. 292.

Astylida C. F. Roem.; WACHSMUTH & SPRINGER (336) p. 16.

†*Atelestocrinus*, arm-branching (p. 77), asymmetry (p. 159); WACHSMUTH & SPRINGER (336).

†*Aulocrinus*, n. g. with genotype *A. agassizi*, Keokuk group, Indiana, with branching anal tube; WACHSMUTH & SPRINGER (336) p. 138, pl. vii, fig. 9: n. sp.

†*Austinocrinus* spp.; STOLLEY (320) pp. 247, 272.

†*Baerocrinus*, compound radials; WACHSMUTH & SPRINGER (336) pp. 72, 158.

†*Balanocrinus subteres*, Callovian (p. 55), Oxfordian (pp. 60, 65), Bas-Languedoc; ROMAN (281).

†*Barrandeocrinidæ*, defined, includes only *Barrandeocr.*; ZITTEL (356) p. 129, and ZITTEL-EASTMAN (357) p. 144.

†*Barrandeocrinus*, rediagnosed and described from type-specimens of *B. sceptrum*, referred to *Batocrinidæ* (p. 484, pl. viii), arms (p. 86); WACHSMUTH & SPRINGER (336).

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†*Barycrinus*, stem (pp. 40, 45 & 46), armlets (p. 82); WACHSMUTH & SPRINGER (336).

B. elrodi, St Louis Group, Spergen Hill, Ind.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 38, pl. ii.—*B. neglectus*, Keokuk Group, Crawfordsville, Ind.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 28, pl. ii.—*B. sampsoni*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 81, pl. iv : n. spp.

Bathycrinus, stem (p. 40), base (p. 63); WACHSMUTH & SPRINGER (336).

†*Batocrinidæ*, defined, analysis and distribution of genera, divided into *Batocrinites* and *Periechocrinites* (p. 361), arms (p. 86), anals (p. 130); WACHSMUTH & SPRINGER (336).

†*Batocrinites*, defined; WACHSMUTH & SPRINGER (336) pp. 361, 366.

Batocrinus, rediagnosed and discussed (pp. 364, 366), arm-branching (p. 77), tegmen (p. 109), pores (p. 122); WACHSMUTH & SPRINGER (336): N. Amer. spp. discussed, family *Batocrinidæ* not admitted; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 21.—*B. æqualis*, redescr., incl. *B. doris*, Hall; WACHSMUTH & SPRINGER (336) p. 371, pl. xxviii.—*B. argutus*, variation from type; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 66.—*B. boonvillensis* S. A. Miller = *Dizygocr. originarius*, var. *adultus* (p. 423); *B. bulbosus* Rowley & Hare = *Lobocr. inflatus* (p. 444); *B. calvini*, redescr., approaches *Dizygocr.* (p. 373, pl. xlvi); *B. cantonensis*, redescr. (p. 383, pl. xxvii); *B. cassedayanus* M. & W. = *Lobocr. longirostris* (p. 442); *B. clypeatus*, redescr., incl. *B. inornatus* and *B. papillatus* Hall, and *B. comparilis* S. A. Miller (p. 380, pl. xxvii); *B. davisi* Rowley & Hare = *Dizygocr. unionensis* (p. 424); *B. grandis*, cirri (p. 443), redescr., incl. *Actinocr. wachsmuthi* White (p. 381, pl. xxvii); WACHSMUTH & SPRINGER (336).—*B. gurleyi* S. A. Miller, see *Dizygocr.*: Rowley & Hare, see *D. montgomeryensis*.—*B. irregularis*, redescr. (p. 369, pl. xxvii); *B. icosidactylus*, redescr. (p. 368, pl. xxvii); *B. laura*, abnormal formation of anal tube (p. 135, pl. iv), with var. *sinuosus*, redescr., incl. *B. scyphus* Miller & Gurley (p. 384, pl. xxix); *B. lepidus*, redescr. (p. 372, pl. xxviii); *B. longirostris*, abnormal formation of anal tube (p. 135); *B. lyonanus* Miller & Gurley, syn. of *Dizygocr. biturbinatus* (p. 427); *B. macbridei*, redescr. (p. 376, pl. xxx); WACHSMUTH & SPRINGER (336).—*B. marinus* Miller & Gurley, vide *Lobocr. spiniferus*.—*B. mediocris* S. A. Miller, syn. of *Dizygocr. originarius*, var. *adultus* (p. 423); *B. mundulus*, redescr., incl. *B. similis* Hall (p. 382, pl. xxx); *B. pistillus*, redescr. (p. 378, pl. xxxi); *B. poculum*, redescr. (p. 378, pl. xxx); *B. pulchellus* S. A. Miller, syn. of *Dizygocr. unionensis* (p. 424); *B. quasillus*, redescr. (p. 372, pl. xxviii); *B. rotadentatus*, redescr., transition to *Lobocr.* and *Eretmocr.* (p. 374, pl. xlvi); *B. spergenensis* S. A. Miller, syn. of *Dizygocr. whitei* (p. 419); *B. subæqualis*, tube bursting forth above basals (p. 136), redescr., incl. *B. discoideus* Hall and *B. formosus* M. & W. (p. 369, pl. xxviii); *B. subconicus* Worthen, syn. of *Dizygocr. euconus* (p. 430); *B. turbinatus* with var. *elegans*, redescr., incl. *B. lætus* Miller & Gurley (p. 375, pl. xxvii); *B. venustus* S. A. Miller, syn. of *Dizygocr. euconus* var. *abscissus* (p. 431); WACHSMUTH & SPRINGER (336).

B. adamsensis, Burlington Group, Adams Co., Ill.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 14, pl. i.—*B. affinis*, Burlington Group, Sagetown, Ill.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 55, pl. iv.—*B. albersi*, Burlington Group, Burlington, Iowa, *op. cit.* p. 38, pl. ii.—*B. approximatus*, *ibid.*; *op. cit.* p. 56, pl. iv.—*B. argutus*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 9, pl. i.—*B. asper*, *ibid.*; *op. cit.* p. 13, pl. i.—*B. asperatus*, Burlington Group, Adams Co., Ill.; *op. cit.* p. 12, pl. i.—*B. basilicus*, Burlington Group, Sedalia, Mo.; *op. cit.* p. 11, pl. i.—*B. cistula*, St.

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Louis Group, Lanesville, Ind.; *op. cit.* p. 18, pl. i.—*B. cognatus*, Burlington Group, Burlington, Iowa, with abnormal specimen (p. 66); MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 60, pl. iv.—*B. complanatus* [sic], *ibid.*; *op. cit.* p. 27, pl. i.—*B. consanguineus*, *ibid.*, with abnormal specimen perhaps of this species; *op. cit.* p. 63, pl. iv.—*B. delicatulus*, Keokuk Group, Boonville, Mo.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 12, pl. i.—*B. douglassi*, Keokuk Group (?), Bridger Mountains, near Bozeman, Montana; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 29, pl. ii.—*B. enodatus*, Burlington Group, Sagetown, Ill.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 46, pl. ii.—*B. enodis*, Burlington Group, Burlington, Iowa; *op. cit.* p. 25, pl. i.—*B. faberi*, Burlington Group, Adams Co., Ill.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 18, pl. ii.—*B. folliculus*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 15, pl. i.—*B. germanus*, *ibid.*; *op. cit.* p. 5, pl. i.—*B. glaber*, Burlington Group, Burlington, Iowa; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 32, pl. i.—*B. hodgsoni*, Burlington Group, Adams Co., Ill.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 8, pl. i.—*B. insolens*, Burlington Group, Burlington, Iowa, MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 35, pl. ii.—*B. jessiæ*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 20, pl. i.—*B. levigatus*, Burlington Group, Burlington, Iowa; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 29, pl. i.—*B. levis*, *ibid.*; *op. cit.* p. 23, pl. i.—*B. modulus*, Burlington Group, Adams Co., Ill.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 16, pl. i.—*B. nanus*, Burlington Group, Sedalia, Mo.; *op. cit.* p. 17, pl. i.—*B. nitens* [? err. pro *nitens*], Burlington Group, Burlington, Iowa; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 15, pl. i.—*B. nodosarius*, Burlington Group, Adams Co., Ill.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 22, pl. i.—*B. nodosus*, *ibid.*; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 5, pl. i.—*B. nodulosus*, *ibid.*; *op. cit.* p. 6, pl. i.—*B. parilis*, Keokuk Group, Boonville, Mo.; *op. cit.* p. 17, pl. ii.—*B. pettisensis*, Burlington Group, Sedalia, Mo.; *op. cit.* p. 19, pl. ii.—*B. politus*, Burlington Group, Burlington, Iowa; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 31, pl. i.—*B. proximus*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 7, pl. i.—*B. regalis*, *ibid.*; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 14, pl. i.—*B. reliquus*, Burlington Group, near Sharon, S. W. Missouri; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 22, pl. i.—*B. remotus*, Burlington Group, Burlington, Iowa; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 43, pl. ii.—*B. repertus*, Burlington Group, Sedalia, Mo.; *op. cit.* p. 70, pl. iv.—*B. repositus*, Burlington Group, Burlington, Iowa; *op. cit.* p. 45, pl. ii.—*B. reservatus*, Burlington Group, near Sharon, S.W. Missouri; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 25, pl. i.—*B. rotuliformis*, *ibid.*; *op. cit.* p. 26, pl. i.—*B. rudis*, Keokuk Group, Little Barren R., Ky.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 52, pl. iv.—*B. rusticellus*, Burlington Group, near Sharon, S.W. Missouri; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 23, pl. i.—*B.* (?) *rusticus*, *ibid.*; *op. cit.* p. 28, pl. ii.—*B. saccellus*, Burlington Group, Burlington, Iowa; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 40, pl. ii.—*B. sagetownensis*, Burlington Group, Sagetown, Ill.; *op. cit.* p. 54, pl. iv.—*B. salemensis*, Warsaw Group, Salem, Ind.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 8, pl. i.—*B. scitulus*, Burlington Group, near Sharon, S.W. Missouri; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 19, pl. i.—*B. sedaliensis*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 71, pl. iv.—*B. selectus*, Burlington Group, Sagetown, Illinois; *op. cit.* p. 37, pl. ii.—*B. senex*, Burlington

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Group, near Sharon, S.W. Missouri; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 21, pl. i.—*B. sharonensis, ibid.*; *op. cit.* p. 18, pl. i.—*B. signatus*, Keokuk Group, Keokuk, Iowa; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 10, pl. i.—*B. solitarius*, Burlington Group, Adams Co., Ill.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 22, pl. ii.—*B. speciosus*, Burlington Group, Burlington, Iowa; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 47, pl. ii.—*B. spurius, ibid.*; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 20, pl. ii.—*B. stelliformuis* [sic], Keokuk Group, Boonville, Mo.; *op. cit.* p. 9, pl. i.—*B. strenuus, ibid.*; *op. cit.* p. 11, pl. i.—*B. subæquatus*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 72, pl. iv.—*B. sublevis*, Burlington Group, Sagetown, Ill.; *op. cit.* p. 41, pl. ii.—*B. subovatus*, Burlington Group, Burlington, Iowa; *op. cit.* p. 50, pl. ii.—*B. subrotundus, ibid.*; *op. cit.* p. 48, pl. ii.—*B. subscitulus*, Burlington Group, Sedalia, Mo., *op. cit.* p. 51, pl. iii.—*B. tuberculatus*, Lower Burlington, Burlington, Iowa; WACHSMUTH & SPRINGER (336) p. 380, pl. xxvii.—*B. variabilis*, Burlington Group, Iowa, Mo. and Ill.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 58, pl. iv: n. spp.

†*Belemnocrinidæ*, defined; ZITTEL-EASTMAN (357) p. 153.

†*Belemnocrinus*, base (p. 57), armlets (p. 82); WACHSMUTH & SPRINGER (336).—*B. florifer*, cirri (p. 44); *B. typus*, arm-branching (p. 75), cirri (p. 44); WACHSMUTH & SPRINGER (336).

†*Blairocrinus* S. A. Miller = *Actinocr.* (p. 555); *B. bullatus*, S. A. Miller = *Actinocr. arrosus* (p. 577); WACHSMUTH & SPRINGER (336).

†*Botryocrinus*, has armlets not pinnules (pp. 82, 160), anals (p. 127); WACHSMUTH & SPRINGER (336).—*B. decadactylus*, restored figure; BATHER (28) p. 99.

Bourgueticrinidæ, defined, includes *Bourgueticr.*, *Rhizocr.*, *Mesocr.*, *Bathycr.*; ZITTEL (356) p. 141: not the last two; ZITTEL-EASTMAN (357) p. 169.

†*Bourgueticrinus*, joint-surfaces of stem; WACHSMUTH & SPRINGER (336) p. 48.—*B. ellipticus*; HUME (134) p. 568: conglomérats des Gas, columnals figured; LORY & SAYN (197) pp. 13, 27.—*B.*, sp., Senonian, Caucasus; FOURNIER (85) p. 159.

B., sp. n.; STOLLEY (319) Arch. Anthrop. Geol. Schleswig, i, p. 147.

†*Cacabocrinus*, syn. of *Dolatocrinus*; WACHSMUTH & SPRINGER (336) p. 311.—*C. troosti*, cirri; JAEKEL (144) p. 48.

†*Cactocrinus*, n. g., with genotype *C. proboscidalis* (p. 600), arms (p. 85), food-grooves (p. 101); WACHSMUTH & SPRINGER (336).—*C. arnoldi* (olim *Actinocr.*) W. & Sp., redescr. (p. 624, pl. lvii); *C. clarus* (olim *Actinocr.*) Hall, redescr. (p. 612, pls. lvii & lviii); *C. cælatus* [err. pro *cælatus*] (olim *Actinocr.*) Hall (p. 618, pl. lix), var. *spinotentaculus* (p. 619, pl. lix), redescr.; *C. ectypus* (olim *Strotocr.* et *Actinocr.*) M. & W., redescr. (p. 611, pl. lvi); *C. fossatus* (olim *Actinocr.*) S. A. Miller, redescr. (p. 620, pl. lv); *C. glans* (olim *Actinocr.*) Hall, redescr., incl. *A. tholus* et *A. eryx* Hall, et *A. blairi* S. A. Miller (p. 625, pl. liv), ambulacra (p. 102, pl. iv); *C. limabrachiatus* (olim *Actinocr.*) Hall, redescr. (p. 608, pl. lviii); *C. longus* (olim *Actinocr.*) M. & W., redescr. (p. 609, pl. lvii); *C. lucina* (olim *Actinocr.*) Hall, redescr., incl. *A. puteatus* Rowley & Hare (p. 663, pl. lvi); *C. multibrachiatus* (olim *Actinocr.*) Hall, redescr., incl. var. *echinatus* (p. 617, pls. lvi, lviii); *C. nodobrachiatus* (olim *Actinocr.*) W. & Sp., redescr. (p. 622, pl. lvii); *C. opusculus* (olim *Actinocr.*) Hall, redescr. (p. 607, pl. lvi); *C. ornatissimus* (olim *Actinocr.*) W. & Sp., redescr. (p. 621, pl. lvii); *C. proboscidalis* (olim *Actinocr.*) Hall, redescr., incl. *A. quaternarius*, *A. excerptus*, *A. themis*, et *A. lagena*, Hall, et *A. dalyanus* S. A. Miller (p. 601, pl. lviii), ambulacra (p. 102, pl. v), tegmen (p. 107); *C. reticulatus* (olim *Actinocr.*) Hall, redescr., incl. *A. thoas* et *A. locellus*, Hall (p. 605, pl. lviii), var. *ovatus* (p. 606, pl. lvii); *C. sexarmatus* (olim

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Actinocr.) Hall, redescr. (p. 615, pl. lv); *C. thalia* (olim *Actinocr.*), redescr., incl. *A. infrequens* Hall, et *A. nodosus* S. A. Miller (p. 604, pls. lvi & lvii); *C. thetis* (olim *Actinocr.*) Hall, redescr., incl. *A. securus* Hall (p. 614, pl. lvi); WACHSMUTH & SPRINGER (336).

C. denticulatus, Lower Burlington Limest., Burlington, Ia.; WACHSMUTH & SPRINGER (336) p. 606, pl. lvii.—*C. extensus*, *ibid.*, incl. *Actinocr. sexarmatus* (pars) Hall; *op. cit.* p. 616, pl. lvii.—*C. obesus* (quoted as Keyes MS), Lower Burlington Limest., Hannibal, Mo.; *op. cit.* p. 613, pl. lv: n. spp.

Calamocrinus, proximale (p. 40), root (p. 51), arm-branching (p. 78), orals (p. 99); WACHSMUTH & SPRINGER (336).

†*Calceocrinidæ*, definitions after Bather; ZITTEL-EASTMAN (357) p. 154: syzygies, armlets (p. 82), systematic position (pp. 157 & 158); WACHSMUTH & SPRINGER (336).

†*Calceocrinus*, compound RR; WACHSMUTH & SPRINGER (336) p. 72.

†*Callicrinus*, rediagnosed; WACHSMUTH & SPRINGER (336) p. 353: vide etiam sub *Cryptodiscus.*—*C. acanthinus*, redescr. (p. 356, pl. lxxxiii); *C. beachleri*, redescr. (p. 355, pl. lxxxiii); *C. cornutus*, redescr., incl. var. *excavatus* Hall (p. 357, pl. lxxxiii); (?) *C. ramifer* (olim *Eucalyptocrinus*) Roemer, redescr. (p. 358); WACHSMUTH & SPRINGER (336).

†*Calpiocrinus*, base (pp. 52, 58), arm-branching (p. 77); WACHSMUTH & SPRINGER (336).

†*Calyptocrinidæ*, stem (p. 43), defined, analysis and distribution of genera (p. 330); WACHSMUTH & SPRINGER (336): defined, incl. *Callicr.*, *Eucalyptocr.*, *Hypanthocr.*; ZITTEL (356), p. 133, & ZITTEL-EASTMAN (357) p. 148.

†*Camarocystida* = *Lobolithes*, regarded as brood-pouches or parasite-cysts of crinoid stems; HAECKEL (118) p. 168.

Camerata W. & Sp. (p. 26), redefined (pp. 149, 151), geol. history and classification (p. 162), analysis of families (p. 170), geol. and geogr. distrib. (pp. 171 & 172); WACHSMUTH & SPRINGER (336): (=*Sphæroidocrinacea* Neumayr) defined, incl. famm. *Gasterocomidæ*, *Platycrinidæ*, *Hexacrinidæ*, *Actinocrinidæ*, *Barrandeocrinidæ*, *Glyptocrinidæ*, *Rhodocrinidæ*, *Melocrinidæ*, *Polypeltidæ*, *Calyptocrinidæ*, *Crotalocrinidæ*; ZITTEL (356) p. 126: classification of WACHSMUTH & SPRINGER (336) given, and partly followed; ZITTEL-EASTMAN (357) p. 138.

†*Camptocrinus*, n. subg. of *Dichocrinus*, with genotype *C. myelodactylus*, Keokuk group, Indian creek, Montgomery Co., Ind. (p. 779, pl. lxxv); *C. cirrifer*, Kaskaskia group, near Sloans Valley, Pulaski Co., Ky. (p. 780, pl. lxxvi); the cirri of the two species (p. 44); WACHSMUTH & SPRINGER (336): n. spp.

Canaliculata Chapman; WACHSMUTH & SPRINGER (336) p. 30.

†*Canist*[*r*]*ocrinus*; JAMES (146): rejected, *C. richardsoni* is *Glyptocrinus*, *C. pattersoni* is indet.; WACHSMUTH & SPRINGER (336) p. 174.

†*Carabocrinus*, tegmen (pp. 137, 162), anals (p. 127), anus (p. 137); WACHSMUTH & SPRINGER (336).

†*Castanocrinus* Roemer, syn. of *Melocrinus*; WACHSMUTH & SPRINGER (336) p. 293.

†*Catillocrinidæ*, arms (p. 82), systematic position (pp. 157 & 158); WACHSMUTH & SPRINGER (336): defined (p. 153) ZITTEL-EASTMAN (357).

†*Catillocrinus*, chambered organ (p. 45), compound RR (p. 72), axial canals (p. 142); WACHSMUTH & SPRINGER (336).

†*Centrocrinus* W. & Sp. 1881, non Austin 1843, nec Worthen [nomen mutandum est], rediagnosed (p. 308), *C. pentaspinus*, redescr., incl. *C. multicornus* (p. 309, pl. xxv); WACHSMUTH & SPRINGER (336).

†*Ceriocrinus*, anals; WACHSMUTH & SPRINGER (336) p. 133.—*C. greppini* Oppel, made syn. of *Millericrinus milleri*; HUG (133) p. 405.

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†"*Cheirocrinus*" *clarus*, end of stem, terminal plate; WACHSMUTH & SPRINGER (336) p. 51.
Cionacineti T. & T. Austin; WACHSMUTH & SPRINGER (336) p. 16.
Cladoidea, coil of gut inferred from the bulla; JAEKEL (142) p. 31.
Clematocrinus, n. g., with genotype *Actinocrinus retiarius* Phillips; JAEKEL (144) p. 47.
Clonocrinus Oehlert non Quenst., syn. of *Melocrinus*; WACHSMUTH & SPRINGER (336) p. 294.
Coadunata J. S. Miller; WACHSMUTH & SPRINGER (336) p. 13.
†*Coccocrinidæ*, defined, incl. *Coccocr.* and *Allagecr.*; ZITTEL (356) p. 124.
†*Coccocrinus*; FRECH (88) p. 177: systematic position discussed; BATHER (30) p. 341: rediagnosed (p. 738), orals (pp. 90, 94, pl. iii); *C. bacca*, redescr. (p. 739, pl. lxiv); *C. rosaceus*, arms and tegmen (p. 739, pl. iii); WACHSMUTH & SPRINGER (336).
†*Codiacrinus*, arm-branching; WACHSMUTH & SPRINGER (336) p. 77: systematic position; OEHLERT (250) p. 829.—*C. granulatus*, redescr., from Sta. Lucia, Spain; OEHLERT (250) p. 827.
Columnida T. & T. Austin; WACHSMUTH & SPRINGER (336) p. 16.
Comatulidæ, defined, includes *Antedon*, *Endiocr.*, *Actinometra*, *Atelecr.*, *Promachocr.*, *Thaumatocr.*, *Thiolliericr.*; ZITTEL (356) p. 145, and ZITTEL-EASTMAN (357) p. 174.
†*Compsocrinus*, rediagnosed (p. 516), arms (p. 80); *C. harrisi*, redescr. (p. 517, pl. xxi), *C. miamiensis* (olim *Glyptocr.*) S. A. Miller, redescr. (p. 518, pl. xxi); WACHSMUTH & SPRINGER (336).
†*Conocrinus* (*Rhizocrinus*) *piriformis*; POPOVICI-HATZEG (270) p. 249.
†*Cordylocrinus*, rediagnosed (p. 735), arms (p. 79); WACHSMUTH & SPRINGER (336): systematic position discussed; BATHER (30) p. 341.—*C. plumosus* (olim *Platycrinus*), redescr., incl. *Platycr.* vel. *Cordylocr. parvus* Hall (p. 737, pl. lxiv); (?) *C. ramulosus* (olim *Platycr.*) Hall, redescr. (p. 737); WACHSMUTH & SPRINGER (336).
Costata Joh. Müller (p. 15), Zittel (p. 23); WACHSMUTH & SPRINGER (336).
†*Cotyledonocrinus* Cass & Ly., = *Dichocr.*; WACHSMUTH & SPRINGER (336) pp. 753 & 754.
†*Cromyocrinus*, arms; WACHSMUTH & SPRINGER (336) p. 80.
†*Crotalocrinidæ*, systematic position; WACHSMUTH & SPRINGER (336) p. 164: defined, includes *Crotalocr.* & *Enallocr.*, referred to *Camerata*; ZITTEL (356) p. 133, and ZITTEL-EASTMAN (357) p. 149.
†*Crotalocrinus*, allied to *Gissocrinus*; JAEKEL (144) p. 47: joint-surfaces (p. 81), stem-lumen (p. 46); *C. pulcher*, arm-branching (p. 75); WACHSMUTH & SPRINGER (336).
†*Cryptodiscus*, referred to *Medusæ*, and following n. spp. described and figured from Niagara Limest., Joliet, Illinois, *C. bilobus* (p. 749), *C. corrugatus* (p. 747), *C. digitatus* (p. 749), *C. hydei* (p. 748), but in added footnote (p. 744) *Cryptodiscus* is regarded as summit-plates of anal tube of *Callicrinus*; WELLER (339) J. Geol. v: redescribed as summit of anal tube of *Callicrinus*, on evidence of specimens from Niagara Limest., Racine, Wis.; WELLER (340).
†*Ctenocrinus*, discussed and made syn. of *Melocrinus*; WACHSMUTH & SPRINGER (336) p. 294.—*C. typus*; FRECH (88) p. 177.
†*Culicocrinus*, systematic position; BATHER (30) p. 344: arms (p. 79), orals (p. 90); *C.*, sp., Niagara group, Maquoketa, Ia. (p. 735, pl. lxiv); WACHSMUTH & SPRINGER (336).
†*Cupressocrinidæ*, defined, includes only *Cupressocr.*; ZITTEL (356) p. 126, and ZITTEL-EASTMAN (357) p. 136.
†*Cupressocrinus*; FRECH (88) p. 177: muscle-plates (p. 87), anus (p. 137), axial canals of stem (p. 46), axial cords (p. 141); WACHSMUTH & SPRINGER (336): radials and basals and columnals from Sta. Lucia,

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Spain, figured; OEHLERT (250) p. 824.—*C. abbreviatus* (=*C. schlotheimi*) includes *C. nodosus*; BEYER (38) p. 88, pl. iii, figg. 73–76.

†*Cyathocrinacea* Neumayr; WACHSMUTH & SPRINGER (336) p. 29.

Cyathocrinidæ, defined, includes *Dendrocr.*, *Homocr.*, *Cyathocr.*, *Lecythocr.*, *Gissocr.*, *Arachnocr.*, *Sphærocr.*, *Bactrocr.*, *Codiacr.*, *Achradocr.*, *Botryocr.*, *Euspirocr.*, *Sicyocr.*, *Streptocr.*, *Thenarocr.*, *Mastigocr.*, *Baryer.*, *Vasocr.*, *Parisocr.*, *Atelestocr.*; ZITTEL (356) p. 134: add *Gastrocr.*, *Rhadinocr.*, and *Lecythiocr.*; ZITTEL-EASTMAN (357) p. 155: sensu Bather, discussed; WACHSMUTH & SPRINGER (336) p. 159.

Cyathocrinides Pictet; WACHSMUTH & SPRINGER (336) p. 18.

†*Cyathocrinus*, anals (p. 128), anus (p. 137), arm-branching (p. 77), food-grooves and ambulacrals (p. 101), tegmen (p. 95, pl. iii, & p. 114), stem (p. 45); *C. alutaceus*, tegmen (pp. 96, 98, 162); WACHSMUTH & SPRINGER (336).—*C.* (?) *annulatus*, perhaps same as *C. glomeratus*; COLLINS (54) p. 81, pl. E.—*C. blairi*, redescr., probably [indubitably] not *Cyathocr.*; MILLER & GURLEY (232) p. 50, pl. iii: compared with *Mespilocrinus*; MILLER & GURLEY (233) p. 39.—*C. brevisaccullus*, tegmen; WACHSMUTH & SPRINGER (336) p. 96.—*C. chouteauensis*, column now first described from a small individual; MILLER & GURLEY (233) p. 38, pl.ii.—*C. gilesi* (p. 95), *C. malvaceus* (p. 97), *C. multibrachiatus* and *C. nodosus* (p. 96), tegmina; WACHSMUTH & SPRINGER (336).—*C.* (?) *nodulosus* or *nodosus* (p. 80, pl. D), and *C.* (?) *pinnatus* (p. 76, pl. D), columnals from Cornwall; COLLINS (54).—*C. protuberans* Hall, ? *Pterotocrinus*; WACHSMUTH & SPRINGER (336) p. 793.—*C. ramosus*, see *C. alutaceus* [which is syn.].—*C.* (?) *tenuistriatus*, columnals from Cornwall; COLLINS (54) p. 79, pl. D.—*C. waldronensis* S. A. Miller, may be young *Thysanocrinus inornatus*; WACHSMUTH & SPRINGER (336) p. 192: redescr. from Niagara group, Hartsville, Ind.; MILLER & GURLEY (232) p. 49, pl. iii.—*C.* (?) sp., columnals from Cornwall; COLLINS (54) p. 80, pl. D.

C. barumensis, Devonian, Devonshire; WHIDBORNE (342) P. Geol. Ass. xiv, p. 377, no fig.—*C.* (?), *carinatus*, based on columnals from Cornwall, Palæozoic; COLLINS (54) Tr. Geol. Soc. Cornwall, xii, p. 77, pl. D.—*C. faberi*, Burlington Group, Burlington, Iowa, MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 85, pl. V.—*C.* (?), *leptos*, Crinnis and perhaps Polruan, Cornwall, Palæozoic, columnals only; COLLINS (54) Tr. Geol. Soc. Cornwall, xii, p. 79, pl. D: n. spp.

†*Cyclocrinus macrocephalus*; stem-fragments; PARONA & BONARELLI (259) p. 78. [Vide etiam *Acrochordocrinus*.]

†*Cyphocrinus gorbyi* S. A. Miller, syn. of *Hyptiocrinus typus*; WACHSMUTH & SPRINGER (336) p. 201.

†*Cytocrinus* Roemer, syn. of *Melocrinus*; WACHSMUTH & SPRINGER (336) p. 294.—*C. lævis*, vide *Melocrinus oblongus* and *M. rœmeri*.

†*Dactylocrinus oligoptilus* (olim *Dimerocrinus*) Pacht.; JAEKEL (144) p. 44.

†*Dadocrinus*, considered as ancestor of *Uintacrinus*, its arm structure discussed; BATHER (24) p. 1000 & fig. 13: compared with *Millericrinus recubariensis*; BATHER (27) p. 122.—*D. gracilis* from Recoaro; CREMA (59) p. 860, pl. iia.

†*Decadocrinidæ* Bather, "the most heterogeneous assemblage of genera imaginable"; WACHSMUTH & SPRINGER (336) p. 160.

†*Decadocrinus*, anus; WACHSMUTH & SPRINGER (336) p. 137: vide etiam *Poteriocrinus*.

†*Dendrocrinidæ* Bather, discussed; WACHSMUTH & SPRINGER (336) p. 159.

†*Dendrocrinus*, compound RR (p. 71), arm-branching (p. 78), anals (pp. 126 & 127; *D. casei*, anals (p. 128); WACHSMUTH & SPRINGER (336).

†*Desmidocrinus*, arm-branching; WACHSMUTH & SPRINGER (336) p. 79.

†*Diabolocrinus*, n. g. with genotype *D. perplexus* (p. 249); *D. vesperalis*

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(olim *Rhodocr. Lyriocr.* vel *Archæocr.*) White, redescribed (p. 251, pl. xi); WACHSMUTH & SPRINGER (336).

D. hieroglyphicus (p. 252, pl. x), and *D. perplexus* (p. 249, pl. xi), Trenton group, near Knoxville, Tenn.; WACHSMUTH & SPRINGER (336): n. spp.

†*Diamenocrinus*, arms; WACHSMUTH & SPRINGER (336) p. 80.

†*Dichocrinus*, rediagnosed, incl. *Cotyledonocr.* Cass. & Ly. (p. 753), arms (p. 79), arm-branching (p. 77), syzygies (pp. 81, 84), cirri (pp. 41, 44); WACHSMUTH & SPRINGER (336).—*D. angustus*, redescr. (p. 768, pl. lxxvi); *D. blairi*, redescr. (p. 778, pl. lxxv); *D. cinctus*, redescr. (p. 746, pls. lxxv, lxxvii); *D. comis*, redescr. (p. 770, pl. lxxv); *D. constrictus* M. & W., an idem ac *Talarocr. decornis* ? (p. 789); *D. coxanus*, redescr. (p. 763, pl. lxxvi); *D. crassitestus*, redescr. (p. 769, pl. lxxvi); *D. dichotomus*, redescr. (p. 777); *D. ficus*, redescr. (p. 774, pl. lxxviii); *D. hamiltonensis*, redescr. (p. 772, pl. lxxvi); *D. humburgi*, redescr. (p. 777); *D. inornatus*, cirri (p. 44), redescr. (p. 770, pl. lxxvii); *D. lachrymosus*, ambulacrals (p. 103), redescr., incl. *Platycr. subspinulosus* W. & Sp. (p. 754, pl. lxxvii); *D. lævis*, redescr. (p. 765, pl. lxxvii); *D. lineatus*, redescr. (p. 761, pl. lxxvi); *D. liratus*, redescr. (p. 759, pls. lxxvi & lxxvii); *D. ornatus*, redescr., incl. *D. sculptus* Cass. & Ly. non De Kon. (p. 762, pl. lxxvii); *D. ovatus*, redescr. (p. 760, pls. lxxvi & lxxvii); *D. parvulus*, cirri (p. 44), redescr. (p. 778); *D. pentalobus* (olim *Cotyledonocr.*) Cass. & Ly., redescr. (p. 775, pl. lxxviii); *D. pisum*, redescr. (p. 763, pls. lxxvi & lxxvii); *D. plicatus*, redescr. (p. 758, pl. lxxvii); *D. polydactylus*, ambulacrals (p. 103), redescr., incl. *D. expansus* M. & W. non De Kon. (p. 756, pl. lxxvii); *D. scitulus*, redescr., incl. *D. pocillum* Hall (p. 767, pl. lxxviii); *D. striatus*, redescr. (p. 757, pl. lxxvii); *D. ulrichi*, redescr. (p. 772); WACHSMUTH & SPRINGER (336).

D. bozemanensis, Upper Burlington or Lower Keokuk, Bridger Mts., near Bozeman, Montana; MILLER & GURLEY (235), Bull. Illinois Mus. xii, p. 44, pl. iii.—*D. delicatus*, Kinderhook group of Marshall Co., Ia., and Lower Burlington Limest. of Burlington, Ia., cirri (p. 44); WACHSMUTH & SPRINGER (336), p. 766, pl. lxxvii.—*D. huntsvillæ*, St Louis group, Huntsville and Whitesburg, Ala., incl. *Platycr. parvulus* M. & W. (nom. preocc. S. A. Miller); *op. cit.* p. 773, pl. lxxv.—*D. oblongus*, Warsaw Limest., near Bloomington, Ind.; *op. cit.* p. 759, pl. lxxvii.—*D. pendens*, Upper Burlington Limest., Burlington, Ia.; *op. cit.* p. 774, pl. lxxviii.—*D. superstes*, Kaskaskia group, Pulaski Co., Ky., and Huntsville, Ala.; *op. cit.* p. 767, pl. lxxvi.

Dicyclica Bather, criticised; WACHSMUTH & SPRINGER (336) p. 157.

†*Dimerocrinus*, made syn. of *Thysanocr.*; WACHSMUTH & SPRINGER (336) p. 191.—*D. oligoptilus* Pacht., referred to *Dactylocr.* Quenst.; JAEKEL (144) p. 45.—*D. oligoptilus* and *D. aptilis*, referred to *Taxocr.*; WACHSMUTH & SPRINGER (336) p. 192.

†*Dizygocrinus*, n. g., with genotype *D. indianensis*; WACHSMUTH & SPRINGER (336) p. 413.—*D. andrewsianus* (olim *Actinocr.* et *Batocr.*) McChesney, redescr. (p. 433, pl. xxix); *D. biturbinatus* (olim *Actinocr.* et *Batocr.*) redescr., incl. *Batocr. lyonanus* Miller & Gurley (p. 427 pl. xxxiii); *D. crawfordsvillensis* (olim *Batocr.*), Miller's description translated (p. 417); *D. decoris* (olim *Batocr.*) S. A. Miller, redescr. (p. 420, pl. xxxv); *D. dodecadactylus* (olim *Actinocr.* et *Batocr.*) M. & W., redescr. (p. 432, pl. xxix); *D. euconus* (olim *Batocr.*); M. & W., redescr., incl. *B. subconicus* Worthen (p. 430, pl. xxxv); var. *abscissus* (olim *Batocr. abscissus* Rowley & Hare) incl. *B. venustus* S. A. Miller (p. 431, pl. xlvi); *D. facetus* (olim *Batocr.*) Miller and Gurley, redescr. (p. 418); (?) *D. gorbyi* (olim *Batocr.*) S. A. Miller's description translated (p. 426); *D. gurleyi* (olim *Batocr.*) S. A. Miller non Rowley & Hare, redescr. (p. 422, pl. xxxiv); *D. indianensis*, redescr., arm-branching discussed (p. 415, pls. xxxii, xxxv); n. var. *simplex*, Keokuk group, Crawfordsville,

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Ind. (p. 416, pl. xxxiii); *D. montgomeryensis* (olim *Batocr.*) Worthen, redescr., incl. *Batocr. gurleyi* Rowley & Hare non Miller, and *B. sweeti* Rowley and Hare (p. 428, pls xxxiii, xlvi); var. nov. *unibrachiatus*, Upper Keokuk, Keokuk, Ia. (p. 429, pl. xxxiii); *D. originarius* (olim *Eretmocrinus*) W. & Sp., redescr., incl. *Eretmocr. varsoviensis* (p. 421, pl. xxxiii); var. *adultus* (olim *Eretmocr. adultus*) W. & Sp., redescr., incl. *Batocr. mediocris* and *B. boonvillensis* S. A. Miller (p. 422, pl. xxxv); *D. rotundus* (olim *Actinocr.* et *Batocr.*) Yand. & Shum., redescr., incl. *Actinocr. oblatus* Hall (p. 431, pl. xxix); *D. whitei* (olim *Batocrinus*) W. & Sp., redescr., incl. *Batocr. spergenensis* S. A. Miller (p. 419, pl. xxxiii); *D. whitei*, var nov. *didactylus*, Upper Keokuk, Hamilton, Ill. (p. 420, pl. xxxv); *D. unionensis* (olim *Batocr.*) Worthen, redescr., incl. *B. pulchellus* S. A. Miller, *B. davisi* Rowley & Hare, and possibly *Actinocrinus caroli* Hall (p. 424, pl. xxxv); var. *divalis* (olim *Batocr. divalis* S. A. Miller), redescr. (p. 425, pl. xxxv); WACHSMUTH & SPRINGER (336).

D. cantonensis, Keokuk group, Canton and Edwardsville, Ind.; WACHSMUTH & SPRINGER (336) p. 423, pl. xxxiii.—*D. mutabilis*, Keokuk group, Indian Creek, Montgomery Co.; *op. cit.* p. 429, pl. xxxv: arm-branching discussed, p. 414 : n. spp.

†*Dolatocrinites*, sub-fam., defined; WACHSMUTH & SPRINGER (336) pp. 264, 304.

†*Dolatocrinus*, rediagnosed, has slit-like pores (p. 310), arm-branching (p. 77), pores (p. 122); WACHSMUTH & SPRINGER (336).—*D. canadensis*, redescr., perhaps = *Cacabocrinus troosti* Hall (p. 315, pl. xxv); *D. glyptus*, redescr., incl. var. *intermedius* Hall, and *D. ornatus* Meek (p. 317, pl. xxvi); *D. lacus*, redescr. (p. 311, pl. xxvi); *D. liratus*, redescr., incl. var. *multilira* Hall (p. 319, pl. xxvi); *D. marshi*, redescr. (p. 312, pl. xxvi); var. nov. *hamiltonensis*, Hamilton group, Bear Grass quarries, Louisville, Ky. (p. 314, pl. xxv); *D. speciosus*, redescr. (p. 323, pl. xxv); *D. triadactylus*, redescr. (p. 316, pl. xxvi); WACHSMUTH & SPRINGER (336).

D. aplatus, Hamilton Group, Charlestown, Ind.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 48, pl. iii: tegmen figd; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 49, pl. iii.—*D. argutus*, *ibid.*; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 41, pl. iii.—*D. arrosus*, *ibid.*; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 52, pl. iii.—*D. asper*, *ibid.*; *op. cit.* p. 47, pl. iii.—*D. aspratilis*, *ibid.*; *op. cit.* p. 49, pl. iii.—*D. basilicus*, *ibid.*; *op. cit.* p. 43, pl. iii.—*D. bellarugosus*, *ibid.*; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 43, pl. iii.—*D. cœlatus*, *ibid.*; *op. cit.* p. 46, pl. iii.—*D. charlestownensis*, *ibid.*; *op. cit.* p. 44, pl. iii.—*D. cistula*, *ibid.*; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 46, pl. iii.—*D. dispar*, *ibid.*; *op. cit.* p. 40, pl. ii.—*D. dissimilaris*, *ibid.*; *op. cit.* p. 54, pl. iii.—*D. excavatus*, Upper Helderberg, Clark Co., Ind.; WACHSMUTH & SPRINGER (336) p. 321, pls. xxv & xxvi.—*D. icosidactylus*, Hamilton group, Louisville, Ky.; *op. cit.* p. 319, pl. xxvi.—*D. indianensis*, Hamilton group, Charlestown, Ind.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 40, pl. iii.—*D. laguncula*, *ibid.*; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 51, pl. iii.—*D. lyoni*, *ibid.*; *op. cit.* p. 44, pl. iii.—*D. lyoni*, Upper Helderberg group, Clark Co., Ind.; WACHSMUTH & SPRINGER (336) p. 314, pl. xxv [nom. preocc.].—*D. major*, Upper Helderberg, Falls of the Ohio; *op. cit.* p. 322, pl. xxv.—*D. neglectus*, Hamilton group, near Charlestown, Ind.; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 37, pl. ii.—*D. peculiaris*, Hamilton group, Charlestown, Ind.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 55, pl. iii.—*D. preciosus*, *ibid.*; *op. cit.* p. 41, pl. ii.—*D. tuberculatus*, Hamilton group, Clark Co., Ind.; WACHSMUTH & SPRINGER (336) p. 324, pl. xxv.

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†*Dorycrinus*, rediagnosed and much restricted (p. 454), ambulacra (p. 102, pl. iv), tegmen (p. 107, pl. v); WACHSMUTH & SPRINGER (336).—*D. amœnus* S. A. Miller = *Aorocr. parvus* (p. 477); *D. cornigerus*, redescr., incl. *Actinocr. divaricatus* and *A. decornis* Hall (p. 458, pls. xlii, xliii, xliv); *D. gouldi*, redescr. (p. 456, pls. xliii & xliv); *D. intermedius* (olim var. *D. quinquelobi*), redescr. (p. 461, pl. xliv); *D. kelloggi* Worthen = *Aorocr. spinosulus* (p. 478); *D. mississippiensis*, redescr., incl. var. *spiniger* Hall (p. 455, pls. xliii & xliv); *D. missouriensis*, redescr., incl. *D. desideratus* (p. 463, pls. xliii, xlv); *D. quinquelobus*, redescr. (p. 460, pl. xlii); *D. roemeri*, redescr. (p. 464, pl. xlv); *D. subturbinatus*, redescr. (p. 466, pl. xliii); *D. unicornis*, redescr., incl. *Actinocr. pendens* Hall, *D. lineatus* S. A. Miller, and *D. inflatus* Rowley & Hare (p. 468, pl. xlv); *D. unispinus*, redescr., incl. *Actinocr. trinodus* Hall (p. 467, pl. xlv); WACHSMUTH & SPRINGER (336).

D. alabamensis, Keokuk group ?, Chert Hill, Ala.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 15, pl. iii.—*D. faberi*, Burlington group, Burlington, Ia.; *op. cit.* p. 19, pl. i.—*D. sampsoni*, Burlington group, Sedalia, Mo.; *op. cit.* p. 17, pl. iii.—*D. suboviformis*, Burlington group, near Sharon, S.W. Missouri; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 30, pl. ii : n. spp.

†*Ectenocrinus*, stem (p. 40), compound RR (p. 71), anals (p. 127); WACHSMUTH & SPRINGER (336).

†*Edriocrinus*, base; WACHSMUTH & SPRINGER (336) p. 59.

Emedullata Chapman; WACHSMUTH & SPRINGER (336) p. 30.

†*Enallocrinus*, stem-lumen; WACHSMUTH & SPRINGER (336) p. 46.

†*Encrinidæ*, extended (p. 162), tegmen (p. 116); WACHSMUTH & SPRINGER (336): defined, includes *Encr.*, *Dadocr.*; ZITTEL (356) p. 139: defined, includes *Cromyocr.*, *Phialocr.*, *Stemmatocr.*, *Eupachycr.*, *Erisocr.*, *Ceriocr.*, *Ulocr.*, *Holocr.*, *Dadocr.*; ZITTEL-EASTMAN (357) p. 160.

Encrinoidea T. T. Austin; WACHSMUTH & SPRINGER (336) p. 16.

†*Encrinus*:—*E. aculeatus*, *E. brahli*, and *E. carnalli*; WAGNER (337) p. 100.—*E. gracilis*, arms; WACHSMUTH & SPRINGER (336) p. 80.—*E. liliiformis*; WAGNER (337) p. 100: arms (p. 80), syzygies (p. 81), axial canals in cup (p. 140); WACHSMUTH & SPRINGER (336), and *E.*, sp. columnals, Muschelkalk, G. of Ismid; TOULA (329) p. 158, pl. xviii.—*E. pentactinus* Geinitz, in N. Jahrb. f. Min. 1838, p. 530, is stem of *Holocr. wagneri*; WAGNER (337) p. 99.

Encrinus, n. sp., Muschelkalk, above Creto, Pieve di Buono, in Judicarien; also "erster Basalkranz eines Crinoiden,...zwischen Prezzo und Cimego, im anstehenden Prezzo-kalk"; ARTHABER (16) Verh. geol. Reichsanst. 1896, p. 265.

†*Entrochus dubius* (p. 717), *E. silesiacus* (p. 717), and *E.* cf. *liliiformis* (p. 716); PHILIPPI (266).

†*Epactocrinus grandis*, syzygies; WACHSMUTH & SPRINGER (336) p. 82.

†*Epascocrinoidea*, Neumayr (p. 29), criticised (p. 148); WACHSMUTH & SPRINGER (336).

†*Erisocrinus*, arms (p. 80), anals (p. 133); WACHSMUTH & SPRINGER (336).—*E. inflexus*; SMITH (313) p. 236.

†*Eretmocrinus*, rediagnosed (p. 385); *E. calyculoides*, redescr., with var. nov. *nodosus*, Upper Burlington, Pleasant Grove, Ia. (p. 395, pl. xxxiv); *E. clio*, redescr. (p. 393, pls. xxxvi & xxxvii); *E. cloelia*, redescr. (p. 398, pl. xxxvi); *E. corbulis*, redescr. (p. 399, pl. xxxvi); *E. coronatus*, redescr. (p. 403, pl. xxxvii); *E. intermedius*, redescr. (p. 404, pl. xxxiii); WACHSMUTH & SPRINGER (336).—*E. koninckı*, referred to *Batocr.*; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 13.—*E. leucosia*, redescr., incl. *Dorycr. confragosus* and *Batocr. blairi* S. A. Miller (p. 401, pl. xxxvi); *E. magnificus* Ly. & Cass. non Quenst., redescr., incl. *E. lyonanus* S. A. Miller (p. 386, pl. xxxvii);

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E. matuta, redescr., var. *attenuata* not accepted (p. 396, pl. xxxvii); *E. neglectus*, redescr. (p. 394, pl. xxxvi); *E. prægravis*, redescr. (p. 405, pl. xxxiv); *E. ramulosus*, redescr. (p. 387, pl. xxxvi); *E. remibrachiatus*, redescr., with var. nov. *expansus*, Burlington and Keokuk transition bed, near Burlington, Ia., and Henderson Co., Ill. (p. 388, pl. xxxvii); *E. varsoviensis* Worthen, syn. of *Dizygocr. originarius* (p. 421); WACHSMUTH & SPRINGER (336).

E. depressus, Upper Burlington, Burlington, Ia.; WACHSMUTH & SPRINGER (336) p. 392, pl. xxxvi.—*E. granuliferus*, Keokuk group, Indian creek, Montgomery Co., Ind. and Canton, Ind.; *op. cit.* p. 390, pl. xxxiv.—*E. minor*, Upper Burlington, Burlington, Ia.; *op. cit.* p. 391, pl. xxxvi.—*E. rugosus*, Lower Burlington, Burlington, Ia.; *op. cit.* p. 402, pl. xxxvi: n. spp.

†*Eucalyptocrinus*; FRECH (88) p. 177: rediagnosed and structure explained, incl. *Hypanthocrinus*; WACHSMUTH & SPRINGER (336) p. 332. —*E. cœlatus* (errore pro *cælatus*), redescr., incl. *E. decorus* Hall non Phill. and *E. papulosus* Hall (p. 336, pl. lxxxiii); *E. crassus*, end of stem, terminal plate (p. 51), redescr., incl. *E. constrictus* Hall, and *E. chicagoensis* Winchell & Marcy (p. 342, pl. lxxxi); *E. depressus*, redescr. (p. 349, pl. lxxxiii); *E. egani*, redescr. (p. 352, pl. lxxxii); *E. ellipticus* S. A. Miller, young form, sp. indet. (p. 335); *E. elrodi*, redescr. and revised, syn. *E. cælatus* Hall pars and *E. subglobosus* S. A. Miller (p. 339, pl. lxxxi); *E. inconspectus*, redescr. (p. 346, pl. lxxxiii); *E. lindahli*, redescr., incl. *E. wortheni* S. A. Miller (p. 347, pl. lxxxii); *E. magnus*, redescr. (p. 348, pl. lxxxii); *E. obconicus*, redescr. (p. 353, pl. lxxxiii); *E. ornatus*, redescr. (p. 340, pl. lxxxii); *E. ovalis*, redescr. and compared with *E. crassus* (p. 344, pl. lxxxii); *E. proboscidalis*, redescr. (p. 352, pl. lxxxii); *E. rotundus*, redescr. (p. 350); *E. splendidus*, redescr. (p. 350); *E. tuberculatus*, redescr., incl. *E. muralis* Ringueb. (p. 337, pl. lxxxiii); *E. turbinatus*, redescr. (p. 351, pl. lxxxii); WACHSMUTH & SPRINGER (336).

E. milliganæ, Niagara group, Decatur Co., Tenn.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 88, pl. v.—*E. ventricosus*, Niagara group, Decatur and Wayne Cos., Tenn.; WACHSMUTH & SPRINGER (336) p. 341, pl. lxxxiii: n. spp.

Eucladocrinus, rediagnosed (p. 719), arm-branching (p. 76), arm-structure (pp. 84 & 85), ambulacrals (p. 101); WACHSMUTH & SPRINGER (336). —*E. millebrachiatus*, axillary ambulacrals (p. 104), redescr. (p. 720, pls. lxxiii & lxxiv), var. nov. *immaturus*, Burlington and Keokuk Transition bed, near Burlington, Ia. (p. 722, pl. lxxiii); *E. montanensis*, redescr. (p. 723, pl. lxxii); *E. pleuroviminus*, redescr., incl. *Platycr. discoideus* Hall non O. & S. (p. 724, pls. lxxiii & lxxiv); *E. prænuntius* (olim *Platycr.*) W. & Sp., redescr. (p. 726, pl. lxxiii); *E. tuberosus* (olim *Platycr.*) Hall, redescr., incl. *P. occidentalis* S. A. Miller (p. 728, pl. lxxii); WACHSMUTH & SPRINGER (336).

Eucrinoidea Zittel; WACHSMUTH & SPRINGER (336) p. 23.

†*Eucrinus* made syn. of *Thysanocrinus*, exc. *E. minor* and *E. venustus*; WACHSMUTH & SPRINGER (336), p. 192.

Eudiocrinus sp.; KOEHLER (163) p. 478: probably *E. atlanticus*; KOEHLER (164) p. 101.

†*Eugeniacrinidæ*, defined, includes *Eugeniacr.*, *Eudesicr.*, *Tetracr.*, *Phyllocr.*; ZITTEL (356) p. 142, & ZITTEL-EASTMAN (357) p. 170.

†*Eugeniacrinus*:—*E.* cf. *hoferi*, Oxfordian, Caucasus; FOURNIER (85) p. 112.

E. geoffreysi, Neocomian of St.-Pierre de Cherenne (Isère); LORIOL (196) Mem. Soc. Geneve, xxii, p. 24, pl. iii: n. sp.

†*Eupachycrinus*, chambered organ (p. 45), arms (p. 80); WACHSMUTH & SPRINGER (336).

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†*Euspirocrinus*, anals (p. 127); *E. spiralis*, tegmen (pp. 96, 98); WACHSMUTH & SPRINGER (336).

†*Eutrochocrinus*, n. g., with genotype *E. christyi*; WACHSMUTH & SPRINGER (336) p. 408.—*E. christyi* (olim *Batocrinus*), redescr., incl. *B. bisbrachiatus* Whitf. and *B. altiusculus* Miller & Gurley, with var. *trochiscus* (p. 409, pls. xxix, xxxii); *E. christyi*, branching anal tube, and regenerated ditto (p. 135, pl. iv); *E. lovei*, redescr. (p. 412, pls. xxix, xxxii); *E. planodiscus*, redescr. (p. 411, pl. xxxii); WACHSMUTH & SPRINGER (336).

†*Extracrinus*, base; WACHSMUTH & SPRINGER (336), pp. 53, 61, 65.

Fistulata Chapman; WACHSMUTH & SPRINGER (336) p. 30: sensu W. & Sp. (p. 26), redefined (p. 150), includes *Hybocrinidæ*, *Heterocrinidæ*, *Anomalocrinidæ*, *Belemnocrinidæ*, *Gasterocomidæ*, *Catillocrinidæ*, *Calceocrinidæ*, *Dendrocrinidæ*, *Cyathocrinidæ*, *Poteriocrinidæ*, *Astylocrinidæ*, *Encrinidæ*, *Pentacrinidæ*; WACHSMUTH & SPRINGER (336) p. 157: (=*Inadunata fistulata* W. & Sp., *Cyathocrinacea* Neumayr), defined, includes families *Hybocrinidæ*, *Heterocrinidæ*, *Cyathocrinidæ*, *Poteriocrinidæ*, *Calceocrinidæ*, *Catillocrinidæ*, *Belemnocrinidæ*; ZITTEL (356) p. 134, & ZITTEL-EASTMAN (357) p. 150.

†*Flabellocrinus cassianus* Klipstein, is an *Encrinus* allied to *E. cassianus* Laube; BATHER (27) p. 121.

Flexibilia (=*Articulata* W. & Sp. non Müller; *Ichthyocrinacea*), defined, includes families *Ichthyocrinidæ*, *Marsupitidæ*, *Uintacrinidæ*; ZITTEL (356) p. 137, & ZITTEL-EASTMAN (357) p. 163.

†*Forbesiocrinus*, base; WACHSMUTH & SPRINGER (336) p. 58.—"*Forbesiocr.*" *agassizi*, arm-branching, it is not a true *Forbesiocr.*; WACHSMUTH & SPRINGER (336) p. 77.—*F. incurvus* Trautsch., made type of n. g. *Synerocrinus*; JAEKEL (144) p. 46.—*F. multibrachiatus*, Lyon & Casseday's description quoted, and Lyon's original drawing now first published; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 55, pl. iv. *F. greenei*, Keokuk Group, Edwardsville, Ind.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 57, pl. iv.—*F. jerseyensis*, Warsaw Group, Jersey Co., Ill.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 58, pl. iv.—*F. macadamsi*, Keokuk Group, Jersey Co., Ill.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 58, pl. v.—*F. washingtonensis*, Keokuk Group, Washington Co., Ind.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 54, pl. iii: n. spp.

†*Gasterocomidæ*, moved from *Larviformia* to *Fistulata*; WACHSMUTH & SPRINGER (336) p. 157: defined, incl. *Gasterocoma*, *Myrtillocr.* and *Nanocr.*; ZITTEL (356) p. 126: defined; ZITTEL-EASTMAN (357) p. 155.

†*Gasterocoma*, vide *Epactocrinus*.

†*Gaurocrinus* S. A. Miller, rejected; WACHSMUTH & SPRINGER (336) p. 177. —*G. splendens*, vide *Ptychocrinus*.

†*Gazacrinus inornatus*, S. A. Miller, syn. of *Idiocrinus elongatus*; WACHSMUTH & SPRINGER (336) p. 203.

†*Gennaeocrinus*, rediagnosed (p. 547); *G. eucharis*, redescr. (p. 549, pl. xxxiv); *G. kentuckiensis*, redescr., incl. *Actinocr. cornigerus* Ly. and Cass. non Hall, et *A. nyssa* Hall (p. 548, pl. xxxiv); WACHSMUTH & SPRINGER (336).

†*Gilbertsocrinus*, syn. *Ollacr.*, *Goniasteroidocr.*, and *Trematocr.*, rediagnosed and discussed (p. 233), arms (p. 86), pores (p. 122); WACHSMUTH & SPRINGER (336).—*G. fiscellus*, redescr. (p. 245, pl. xvii); *G. obovatus*, redescr. (p. 241, pl. xvii); *G. reticulatus*, redescr. (p. 244, pl. xvii); *G. spinigerus*, redescr. (p. 247, pl. xv); *G. tenuiradiatus*, redescr. (p. 246, pl. xvii); *G. tuberculosus*, redescr. (p. 243, pl. xvii); *G. tuberosus*, redescr. (p. 239, pls. xv, xvi, xvii); *G. typus*, redescr., incl. *Trematocr. papillatus* Hall (p. 242, pls. xiv, xvii); WACHSMUTH & SPRINGER (336).

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G. dispansus, Keokuk group, Indian Creek, Montgomery Co., Ind.; WACHSMUTH & SPRINGER (336) p. 240, pl. xv: n. sp.

†*Glyptaster*, made syn. of *Thysanocrinus*; WACHSMUTH & SPRINGER (336) p. 191.

G. milliganæ, Niagara Group, Decatur Co., Tenn.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 87, pl. v: n. sp.

†*Glyptocrinidæ* S. A. Miller, discussed; WACHSMUTH & SPRINGER (336) p. 175; *Glyptocrinidæ*, defined, incl. *Glyptocr.*, *Glyptaster*, *Reteocr.*, *Canistrocr.*, *Ptychocr.*, *Ascocr.* (=*Ascocystites* Barr.), *Lampterocr.*, *Eucr.*, *Sageniocr.*, *Dimerocr.*, *Stelidiocr.* (*Harmocr.*); ZITTEL (356) p. 130: in part referred to *Thysanocrinidæ*; ZITTEL-EASTMAN (357) p. 145.

†*Glyptocrinus*; JAMES (146): rediagnosed, incl. *Pycnocr.* S. A. Miller (p. 267), root (p. 44), arms (p. 79), interbrachials (p. 117), tegmen (p. 120); WACHSMUTH & SPRINGER (336).—*G. angularis* Miller & Dyer, syn. of *Ptychocr. parvus*; *G. argutus* Walcott, syn. of *Stelidiocr.*; *G. armosus* McChesney, referred to *Siphonocr.*; *G. baeri* Meek, referred to *Xenocr.* (also p. 183); *G. carleyi* Hall, referred to *Mariacr.*; and *G. cognatus* Miller, syn. of *Reteocr. onealli*; WACHSMUTH & SPRINGER (336) p. 269.—*G. decadactylus*, redescr., has no IBB (p. 270, pls. xx & xxi), arm-structure (p. 84); *G. dyeri*, redescr., incl. *G. subglobosus* and *G. richardsoni* (p. 271, pls. xx & xxi), arm-structure (p. 84); *G. expansus* Phillips, referred to *Sagenocrinus* (p. 269); *G. fimbriatus* Shumard, not accepted (p. 269); (?) *G. fornshelli* (p. 45), redescr., with special note on stem (p. 276, pl. xx), stem and base (p. 66); WACHSMUTH & SPRINGER (336).—*G. gracilis* Wetherby, syn. of *Ptychocr. parvus*; *G. harrisi* Miller, referred to *Compsocr.*; *G. lacunosus* Billings, syn. of *Archæocr.*; and *G. libanus* Safford, not accepted; WACHSMUTH & SPRINGER (336) p. 269.—*G. marginatus*, redescr., not *Archæocr.* as supposed (p. 275, pl. xx); *G. miamiensis* Miller, referred to *Compsocr.* (p. 269); *G. nobilis* Hall, referred to *Siphonocr.* (p. 269); *G. ornatus*, redescr., column figd by Billings doubtfully of this species (p. 274, pl. xx); WACHSMUTH & SPRINGER (336).—*G. parvus* Hall, referred to *Ptychocr.*; *G. pattersoni* Miller, not accepted; *G. plumosus* Hall, not accepted; *G. priscus* Billings, syn. of *Periglyptocr.*; and *G. quinquepartitus* Billings, not accepted; WACHSMUTH & SPRINGER (336) p. 269.—*G. ramulosus*, redescr. (p. 273, pl. xx); *G. sculptus* S. A. Miller, has IBB and is a *Rhaphanocr.* (pp. 260, 269); (?) *G. shafferi* with its var. *germanus* S. A. Miller, are probably young examples of *G. dyeri* (p. 272, pl. xxi); *G. siphonatus* Hall, syn. of *Siphonocr. armosus* (p. 269); *G. subnodosus* Walcott, syn. of *Rhaphanocr.* (p. 269); WACHSMUTH & SPRINGER (336) p. 269.

†*Gnorimocrinus*, base (p. 58), anal tube (p. 138); WACHSMUTH & SPRINGER (336).

†*Goniasteroidocrinus*, syn. of *Gilbertsocrinus*; WACHSMUTH & SPRINGER (336) p. 236.

G. faberi, Subcarboniferous, Joplin, Mo.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 84, pl. v: n. sp.

†*Graphiocrinus*, cirri (p. 44), base (p. 60), anals (pp. 128, 133), arms, validity of name questioned, relations to *Phialocr.* (p. 80); WACHSMUTH & SPRINGER (336): not found in America, but forms referred to it belong to *Scaphiocr.*; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 35.—*G. encrinoides*, position of anal; WACHSMUTH & SPRINGER (336) p. 80.

†*Guettardicrinus*, radials (p. 69), interbrachials (p. 117); WACHSMUTH & SPRINGER (336).

†*Habrocrinus*, arm-branching (p. 79); *H. ornatus*, ridges on tegmen (p. 118).

Subgen. nov. *Acacocr.* with genotype *H.* (*A.*) *elrodi*, Niagara group, Hartsville, Bartholomew Co., Ind. (p. 515, pl. xxxiv), *H.* (*A.*) *americanus*,

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Niagara group, St. Paul, Ind. (p. 516, pl. xxxiv); WACHSMUTH & SPRINGER (336): n. spp.

†*Hadrocrinus*, arm-branching (p. 77), rediagnosed (p. 327); *H. discus*, redescr. (p. 328, pl. xxiv); *H. plenissimus*, redescr. (p. 328, pl. xxiv); WACHSMUTH & SPRINGER (336).

†*Hapalocrinidæ*, the family rejected; BATHER (30) p. 343.

†*Hapalocrinus*, erected as single genus with subgenera *Hapalocrinus*, s. str. (*H. elegans*), group of *H.* (*Agriocrinus*) *Frechi*, and group of *H.* (*Thallocrinus*) *retiarius*; FRECH (88) p. 182: rediagnosed, includes *Agriocrinus* and *Thallocrinus*, genotype is *H. elegans* Jaekel; BATHER (30) p. 344.—*H. retiarius*, systematic position discussed; BATHER (30) p. 342: referred to n. g. *Clematocrinus*; JAEKEL (144) p. 47.

H. victoriæ, Silurian, Melbourne; BATHER (30) Geol. Mag. (N. S. Dec. iv) iv, p. 345, pl. xv: n. sp.

Haplocrinacea Neumayr; WACHSMUTH & SPRINGER (336) p. 29.

†*Haplocrinidæ*, defined, includes *Haplocrinus*; ZITTEL (356) p. 124, & ZITTEL-EASTMAN (357) p. 134.

Haplocrinides Pictet; WACHSMUTH & SPRINGER (336) p. 18.

†*Haplocrinus*, anus (p. 137), compound RR (p. 72), orals (pp. 89, 92, pl. iii); WACHSMUTH & SPRINGER (336).—*H. stellaris*; BEYER (38) p. 88, pl. iii, f. 79.

†*Harmocrinus* Ang., is possibly *Thysanocrinus*; WACHSMUTH & SPRINGER (336) p. 280.

†*Hemicrinus astieri*; KILIAN (157) p. 733.

†*Herpetocrinus*, cirri; WACHSMUTH & SPRINGER (336) p. 44.

†*Heterocrinidæ*, armlets; WACHSMUTH & SPRINGER (336) p. 82: defined, includes *Heterocr.*, *Iocr.*, *Stenocr.*, *Ophiocr.* [err. pro *Ohiocr.*]; ZITTEL (356) p. 134: add *Herpetocr.*; ZITTEL-EASTMAN (357) p. 152.

†*Heterocrinus*, relations to *Ottawacr.* (p. 68), stem (p. 40), compound RR (p. 71), syzygies (p. 82), anals (p. 127); WACHSMUTH & SPRINGER (336).—*H. bellevillensis*, anals; WACHSMUTH & SPRINGER (336) p. 132.—*H. pygmæus* is young of *Dactylocr. oligoptilus*; JAEKEL (144) p. 44.

†*Hexacrinidæ*, redefined, analysis and distribution of genera; WACHSMUTH & SPRINGER (336) p. 741: defined, includes *Dichocr.*, *Hystricr.*, *Hexacr.*; ZITTEL (356) p. 127: also *Arthroacantha*, *Pterotocr.*, *Talarocr.*; ZITTEL-EASTMAN (357) p. 140.

†*Hexacrinus*; FRECH (88) p. 177: rediagnosed (p. 744), arms (p. 79); WACHSMUTH & SPRINGER (336).—*H. elongatus*?; BEYER (38) p. 89, pl. iii, fig. 77.—*H. leai*, redescribed; WACHSMUTH & SPRINGER (336) p. 746, pl. lxxviii.—*H. ornatus*?; BEYER (38) p. 89, pl. iii, fig. 78.

H. occidentalis, Hamilton group, near Davenport, Ia.; WACHSMUTH & SPRINGER (336) p. 745, pl. lxxviii: n. sp.

†*Holocrinus wagneri*; WAGNER (337) p. 100.

Holopidæ, defined, includes *Cyathidium*, *Holopus*, *Cotylederma*; ZITTEL (356) p. 143, and ZITTEL-EASTMAN (357) p. 171.

†*Homocrinus*, arm-branching (p. 78), anals (p. 127); WACHSMUTH & SPRINGER (336).—*H. scoparius*, cirri; WACHSMUTH & SPRINGER (336) p. 45.

†*Hoplocrinus*, compound RR; WACHSMUTH & SPRINGER (336) p. 71.

†*Hybocrinidæ*, tegmen; WACHSMUTH & SPRINGER (336) p. 116: defined, includes *Hybocr.* and *Bacrocr.*; ZITTEL (356) p. 134: add *Hoplocr.* and *Hybocystis*; ZITTEL-EASTMAN (357) p. 151.

†*Hybocrinus*, tegmen (p. 162), base (p. 67), compound RR (p. 71), anals (p. 127); *H. conicus*, anus (p. 137); WACHSMUTH & SPRINGER (336).

†*Hybocystis*, considered as link with Cystids; WACHSMUTH & SPRINGER (336) p. 146.

†*Hydreionocrinus*, arms; WACHSMUTH & SPRINGER (336) p. 80.—*Hydrei*[*o*]*nocrinus mucrospinosus*; SMITH (313) p. 236.

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Hyocrinus, base (pp. 58, 63), arm-branching (p. 78), orals (p. 99, pl. iii); WACHSMUTH & SPRINGER (336).

†*Hypanthocrinus*, syn. of *Eucalyptocr.*; WACHSMUTH & SPRINGER (336) p. 335.

Hypascocrinoidea Neumayr (p. 29), criticised (p. 148); WACHSMUTH & SPRINGER (336).

†*Hypocrinus*, vide sub IV G.

†*Hyptiocrinus*, rediagnosed (p. 200), and *H. typus* (syn. *Cyphocrinus gorbyi* S. A. Miller), redescr.; WACHSMUTH & SPRINGER (336) p. 201, pl. xix.

†*Hystricrinus* et *H. carpenteri* = *Arthracantha* et *A. punctobrachiata* [qq. v.]; WACHSMUTH & SPRINGER (336) pp. 748, 751.

Ichthyocrinacea Neumayr; WACHSMUTH & SPRINGER (336) p. 29.

†*Ichthyocrinidæ*, separated from *Taxocrinidæ*; JAEKEL (144) p. 47: stem (p. 40), tegmen (p. 113); WACHSMUTH & SPRINGER (336): defined, includes *Ichthyocr.*, *Lecanocr.*, *Homalocr.*, *Anisocr.*, *Calpiocr.*, *Cyrtidocr.*, *Pycnosaccus*, *Lithocr.*, *Taxocr.*, *Forbesiocr.*, *Onychocr.*, *Mespilocr.*; ZITTEL (356) p. 137, & ZITTEL-EASTMAN (357) p. 163.

†*Ichthyocrinus*, base (p. 58), arm-branching (p. 77), articulation of arms (p. 87); WACHSMUTH & SPRINGER (336).

†*Idiocrinus*, rediagnosed (p. 202), and *I. elongatus* (syn. *Gazacrinus inornatus* S. A. Miller), redescr. (p. 203, pl. xviii); (?) *I. immaturus* (olim *Thysanocrinus*) Hall (p. 206, pl. xviii); (?) *I. tennesseensis* (olim *Centrocrinus*) Worthen, redescr. (p. 206, pl. xviii); WACHSMUTH & SPRINGER (336).

I. ventricosus, Upper part of Niagara group, near St Paul, Ind., oral pyramid previously described as tegmen of *Pisocrinus*; WACHSMUTH & SPRINGER (336) p. 205, pl. xviii: n. sp.

†*Impinnata*, sub-order of *Articulata*, defined; WACHSMUTH & SPRINGER (336) p. 152.

Inadunata W. & Sp. (p. 26), redefined (pp. 149 & 150); WACHSMUTH & SPRINGER (336).

Inarticulata J. S. Miller; WACHSMUTH & SPRINGER (336) p. 13.

†*Iocrinus*, relations to *Merocrinus* (p. 68), compound RR (p. 71), arm-branching (p. 78), anal sac (p. 158), anals (pp. 126 & 127); WACHSMUTH & SPRINGER (336).

†*Lampterocrinus*, rediagnosed, *L. inflatus* Hall and *L. parvus*, not recognised (p. 207); *L. tennesseensis*, redescribed (p. 208, pl. xiii); WACHSMUTH & SPRINGER (336).

Larviformia W. & Sp. (p. 26), redefined (p. 150), include *Haplocrinidæ*, *Pisocrinidæ*, *Symbathocrinidæ*, *Cupressocrinidæ* (p. 157); WACHSMUTH & SPRINGER (336): (= *Inadunata larviformia* W. & Sp., and *Haplocrinacea* Neumayr), defined, includes families *Haplocrinidæ*, *Coccocrinidæ*, *Stephanocrinidæ*, *Pisocrinidæ*, *Symbathocrinidæ*, *Cupressocrinidæ*; ZITTEL (356) p. 124, see also ZITTEL-EASTMAN (357) p. 134.

†*Lecanocrinus*, position of mesentery and gut; JAEKEL (142) p. 30: base; WACHSMUTH & SPRINGER (336) p. 58.—*L. billingsi*, anals, and *L. macropetalus*, anals and interbrachials; WACHSMUTH & SPRINGER (336) p. 139.

L. greenei, Niagara Group, Louisville, Ky.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 52, pl. iii: n. sp.

Liberia T. & T. Austin; WACHSMUTH & SPRINGER (336) p. 16.

†*Lobocrinus*, n. g., with genotype *L. nashvillæ* [syn. ac *Uperocrinus*, melius *Hyperocrinus*]; WACHSMUTH & SPRINGER (336) p. 434.—*L. æquibrachiatus* (olim *Actinocr.* et *Batocr.*) McChesney, redescr. (p. 440, pls. xxix, xlvi), var. *asteriscus* (olim *Batocr. asteriscus* M. & W.), redescr., incl. var. *alatus* Hall (p. 441, pl. xxix); *L. inflatus* (olim *Batocr.*) Rowley & Hare, redescr., incl. *B. bulbosus* R. & H. (p. 444, pl. xxxiv), (?) *L. hageri* (olim *Actinocr.* et *Batocr.*) McChesney, redescr.

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(p. 445, pl. xxx); *L. longirostris* (olim *Actinocr.* et *Batocr.*) Hall, redescr., incl. *B. cassedayanus* M. & W. (p. 442, pl. xxviii); *L. nashvillæ* (olim *Actinocr.* et *Batocr.*) Hall ex Troost, redescr. (p. 435, pl. xxxi), var. *subtractus*, redescr. (p. 436, pl. xxxi); *L. pyriformis* [errore pro *piriformis*] (olim *Actinocr.*, *Uperocr.* [Typ.], et *Batocr.*) Shum., redescr., incl. var. *rudis* et *Batocr. pistilliformis* M. & W. (p. 437, pl. xxxi), recuperated anal tube (p. 136); *L. yandelli* (olim *Actinocr.* et *Batocr.*) Shum., redescr. (p. 441, pl. xxx); WACHSMUTH & SPRINGER (336).

L. robustus, Keokuk group, White's creek Springs, near Nashville, Tenn.; WACHSMUTH & SPRINGER (336) p. 436, pl. xxx.—*L. spiniferus*, Keokuk group, Indian creek, Montgomery Co., Ind. (an *Batocr. marinus* Miller & Gurley ?); *op. cit.* p 439, pl. xxx: n. spp.

†*Lyriocrinus*, rediagnosed, includes *Marsupiocr.* Hall non Phill. (p. 261), food-grooves (p. 101); *L. dactylus*, redescr. (p. 262, pl. xi); *L. melissa*, redescr. (p. 263, pl. xi), *L. sculptilis* vel *sculptus* S. A. Miller, syn. of *Diabolocr. vesperalis* (p. 251); *L.*, sp. nondescr., Dudley (p. 217); WACHSMUTH & SPRINGER (336).

†*Macrocrinus*, n. g., with genotype *M. koninckı* (p. 446); *M. carica* (olim *Eretmocr.*) Hall, redescr. (p. 448, pl. xxxvii); *M. gemmiformis* (olim *Eretmocr.*) Hall, redescr. (p. 449, pl. xxxvi); *M. jucundus* (olim *Batocr.*) Miller & Gurley, redescr., incl. *B. agnatus* M. & G. (p. 451, pl. xxx), branched anal tube (p. 136); *M. koninckı* (olim *Actinocr.*, *Batocr.*, et *Eretmocr.*) Shum., redescr., incl. *A. urnæformis* McChes. (p. 447, pl. xxxv); *M. lagunculus* (olim *Batocr.*) Hall, redescr. (p. 453, pl. xxxv); *M. verneuilianus* (olim *Eretmocr.*) Shum., redescr. (p. 450, pl. xxx), circumoral water-ring (p. 102, pl. v), convoluted organ (p. 143, pl. v); WACHSMUTH & SPRINGER (336).

†*Macrostylocrinus*, rediagnosed; WACHSMUTH & SPRINGER (336) p. 285.—*M. fasciatus*, redescr., may include *Actinocr.* (*Saccocr.*) *semiradiatus* Hall (p. 288, pl. xxii); *M. fusibrachiatus*, redescr. (p. 291, pl. xxiii); *M. granulosus*, var. raised to specific rank (p. 289, pl. xxii); *M. meeki*, redescr. (p. 290, pl. xxii); *M. ornatus*, redescr. after Hall's figure (p. 286, pl. xxiii); *M. striatus*, redescr., does not include HALL, 20 Rep. N. Y. State Cat. pl. x, fig. 7 (p. 287, pl. xxxii); WACHSMUTH & SPRINGER (336).

†*Mariacrinus*; JAMES (146): rediagnosed, with *M. carleyi* as genotype; WACHSMUTH & SPRINGER (336) p. 281.—*M. aureatus*, Miller's description translated (p. 285); *M. carleyi*, redescr. (p. 282, pl. xxii); *M. granulosus* S. A. Miller not a *Mariacr.*, whatever it may be (p. 282); *M. macropetalus* Hall, probably *Corymbocr.* (p. 282); *M. plumosus*, redescr. (p. 284, pl. xxiii); (?) *M. ramosus*, Hall's description translated (p. 284); *M. stoloniferus* Hall, not accepted (p. 282); *M. warreni*, redescr. (p. 283, pl. xxii); WACHSMUTH & SPRINGER (336).

†*Marsupiocrinoidea* T. & T. Austin; WACHSMUTH & SPRINGER (336) p. 16.—†*Marsupiocrinus* Phill. non Blainville nec Hall, rediagnosed, incl. *Cupellæcrinus* Troost [nomen preferendum, melius autem *Cypellocrinus*] (p. 730), stem (p. 40), arm-branching (pp. 75, 79), ambulacrals (p. 103); WACHSMUTH & SPRINGER (336): systematic position; BATHER (30) pp. 342, 344.—*M. depressus*, ridges on tegmen (p. 118); (?) *M. præmaturus*, redescr. (p. 734, pl. lxxii); *M. radiatus*, ridges on tegmen (p. 118, pl. viii); *M. tennesseensis*, redescr. (p. 731, pl. lxxv); *M. tentaculatus*, redescr. (p. 733, pl. lxxv); WACHSMUTH & SPRINGER (336).

M. striatus, Niagara group, Decatur Co., West Tennessee; WACHSMUTH & SPRINGER (336) p. 732, pl. lxxv: n. sp.

†*Marsupites*, nekton or plankton; BATHER (24), and WALTHER (338) p. 222: in Sweden; SCHLUETER (297) p. 46.—*M. ornatus* [i.e. *M.*

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testudinarius]; LAMPLUGH (182) pp. 82 & 83; HUME (134) p. 568: at Broitzem (p. 229), general distribution (p. 272); STOLLEY (320): and *M.* sp. in Lüneburg; STOLLEY (319) pp. 147, 176.

†*Marsupitidæ*, defined, includes only *Marsupites*; ZITTEL (356) p. 138, and ZITTEL-EASTMAN (357) p. 165.

†*Megistocrinus*, rediagnosed (p. 532), stem-lumen (p. 46), food-grooves (p. 101); WACHSMUTH & SPRINGER (336). — *M. abnormis*, redescr. (p. 546, pl. xlix); *M. concavus*, redescr. (p. 543, pl. xlviii); *M. depressus*, redescr., incl. *M. ontario* Hall (p. 540, pl. xlix); *M. evansi*, redescr., incl. *Actinocr. brevicornis* Hall, *A. superlatus* Hall, *A. minor* Hall, *M. plenus* White, et *M. parvirostris* M. & W. (p. 533, pl. xlvii), tegmen (p. 119), stem (p. 39), var. *crassus* (p. 536); *M. farnsworthi*, redescr. (p. 539, pl. xlviii); *M. knappi*, type lost, figures misleading (p. 533); *M. latus*, redescr. (p. 538, pl. xlviii); *M. multidecoratus*, redescr. (p. 542, pl. xlix); *M. nobilis*, redescr., incl. *M. parvus* W. & Sp. (p. 537, pls. xlvii, li), tegmen and relation to ambulacra (p. 119); *M. nodosus*, redescr. (p. 541, pl. xlix); *M. rugosus*, redescr. (p. 542, pl. xlviii); *M. spinosulus*, redescr., incl. *M. pileatus* S. A. Miller (p. 544, pl. xlviii); WACHSMUTH & SPRINGER (336).

M. indianensis, Hamilton Group, Charleston, Ind.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 27, pl. ii.—*M. valiszewskii*, Lower Devon., Sta. Lucia, Spain; OEHLERT (250) Bull. Soc. geol. France (3) xxiv, p. 818, pl. xxvi: n. spp.

†*Melocrinidæ*, defined, separated into *Melocrinites* and *Dolatocrinites*, with analysis of genera, geol. and geogr. distribution; WACHSMUTH & SPRINGER (336) p. 264: defined, includes *Melocr.* (*Ctenocr.*), *Scyphocr.*, *Xenocr.*, *Corymbocr.*, *Abacocr.*; ZITTEL (356) p. 131: enlarged scope; ZITTEL-EASTMAN (357) p. 146.

†*Melocrinus*, rediagnosed (p. 292), arm-branching (pp. 76, 78, 86); WACHSMUTH & SPRINGER (336).—*M. æqualis*, redescr. (p. 304); *M. bainbridgensis*, redescr., incl. *M. clarkei* Williams (p. 297, pls. xxii, xxiv); *M. brevidactylus* Hall, not accepted (p. 294); WACHSMUTH & SPRINGER (336).—†*M. gibbosus* ?; BEYER (38) p. 89, pl. iii, fig. 72.—*M. nobilissimus*, redescr. (p. 295, pl. xxiii); *M. nodosus* Hall, not accepted (p. 294); *M. obconicus*, redescr. (p. 302, pl. xxii); *M. obpyramidalis* Winchell & Marcy, not accepted (p. 294); *M. pachydactylus*, redescr., incl. *M. paucidactylus* (p. 296, pls. xxiii & xxiv); *M. parvus*, redescr. (p. 303, pl. xxii); *M. pratteni* McChesney, *M. sculptus* Hall, and *M. verneuili* Hall, not accepted (p. 294); WACHSMUTH & SPRINGER (336).

M. calvini, Hamilton group, Johnson Co., Iowa; WACHSMUTH & SPRINGER (336) p. 300, pl. xxii.—*M. gracilis*, Hamilton group, Canandaigua Lake, N. Y.; *op. cit.* p. 298, pl. xxii.—*M. oblongus*, Niagara group, near Louisville, Ky., & St. Paul, Ind., separated from *Cytocrinus lævis* Roemer; *op. cit.* p. 300, pl. xxii.—*M. rœmeri*, Niagara group, Decatur Co., Tenn., based on *Cytocrinus lævis* Roemer; *op. cit.* p. 301, pl. xxii.—*M. tiffanyi*, Hamilton group, New Buffalo, Iowa; *op. cit.* p. 299, pl. xxii: n. spp.

†*Merocrinus*, relations to *Iocrinus* (p. 68), compound RR (p. 71), anals (p. 127); WACHSMUTH & SPRINGER (336).

M. salopiæ, Middleton group of Ordovician, from Mincop, W. Shropshire; BATHER (20) Geol. Mag. (n. s.), Dec. iv, vol. iii, p. 74: should be *salopicus*; JUKES-BROWNE (147): no, it shouldn't; BATHER (22): n. sp.

†*Mespilocrinus*, base (p. 58), arm-branching (p. 77); WACHSMUTH & SPRINGER (336).

Metacrinus, base and stem; WACHSMUTH & SPRINGER (336), pp. 65, 67.—*M. rotundus*, "Bird's leg" of Japanese fishermen, caught by long line, esp. when baited with live mackerel; IJIMA (137) pp. 42, 45.

†*Millericrinus*, proximale (p. 39), base (pp. 53, 60, 61); WACHSMUTH &

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SPRINGER (336).—*M. aculeatus*, and *M. dudressieri*; SCHLUETER (298) p. 495.—*M. echinatus* (Schlotheim) 1820, is made syn. of *M. horridus* d'Orb., 1840; HUG (133) p. 392: name maintained; SCHLUETER (298) p. 495.—*M. escheri*; SCHLUETER (298) p. 496.—*M. granulosus*, stem-fragments; PARONA & BONARELLI (259) p. 78.—*M. horridus*; SCHLUETER (298) p. 495.—*M. milleri*, and *M. münsterianus*; HUG (133) p. 405.—*M. orbignyi*; WACHSMUTH & SPRINGER (336) p. 61.—*M. pilleti*, stem-fragments; PARONA & BONARELLI (259) p. 79.—*M. polydactylus*, base; WACHSMUTH & SPRINGER (336) p. 61.—*M. recubariensis*, redescr. and figd; BATHER (27).—*M.* sp.; KILIAN (157) pp. 678, 682.

M. meslei, n. sp. ? Kimeridgian, Djebel Tlalet, S. Tunis; GAUTHIER (98) p. 24, pl. xxxii.—*M.*, n. sp. allied to *M. milleri*, possibly identical with *M. meslei*, Kimeridgian, S. Tunis; *loc. cit.* : n. spp.

Monocyclica Bather, 1893, criticised; WACHSMUTH & SPRINGER (336) pp. 157 & 158.

†*Mycocrinus*, axial canals; WACHSMUTH & SPRINGER (336) p. 142.

†*Myrtillocrinus*, orals; WACHSMUTH & SPRINGER (336), p. 89, pl. iii.

†*Nanocrinus*, asymmetry; WACHSMUTH & SPRINGER (336) p. 159.

Neocrinoidea P. H. Carp.; WACHSMUTH & SPRINGER (336) pp. 25, 148.

†*Ohiocrinus*, compound RR (pp. 71, 158), stem (p. 140); WACHSMUTH & SPRINGER (336).

†*Ollacrinus*, syn. of *Gilbertsocrinus*; WACHSMUTH & SPRINGER (336) p. 236.

†*Onychocrinus*, relations to *Dactylocr.* and *Forbesiocr.*; JAEKEL (144) p. 46: arm-branching (p. 77), anal tube (p. 138), stem (p. 43); WACHSMUTH & SPRINGER (336).—*O. diversus*, tegmen (p. 123); *O. ramulosus*, arm-branching (p. 75); *O. ulrichi*, tegmen (p. 123); WACHSMUTH & SPRINGER (336).

†*Ottavacrinus*, relations to *Heterocrinus* (p. 68), anals (p. 127); WACHSMUTH & SPRINGER (336).

Palæocrinoidea W. & Sp.; WACHSMUTH & SPRINGER (336) pp. 25, 148.

†*Parisocrinus*, stem (p. 45), arm-branching (p. 77), anals (p. 127); WACHSMUTH & SPRINGER (336).

†*Patelliocrinus*, arm-branching; WACHSMUTH & SPRINGER (336) p. 79.

Pentacrinacea Neumayr; WACHSMUTH & SPRINGER (336) p. 30.

Pentacrinidæ, growth changes in stem discussed; JACKSON (139) p. 228: defined, includes *Pentacr.*, *Metacr.*, *Balanocr.*; ZITTEL (356) p. 144: add *Extracr.*; ZITTEL-EASTMAN (357) p. 173.

Pentacrinus, stem (pp. 38, 45, 46), its relations to base (pp. 65, 67), axial cords (p. 141); WACHSMUTH & SPRINGER (336): attached to drifting wood; †WALTHER (338) p. 227.—†*P. amblyscalaris*; HUG (133) p. 405.—†*P. angulatus* Oppel non Quenst.; ROTHPLETZ (282), p. 25.—†*P. bajocensis*, in Bas-Languedoc; ROMAN (281) pp. 40, 47.—†*P.* cf. *basaltiformis*; ROTHPLETZ (282) p. 34: Bajocian, Caucasus; FOURNIER (85) p. 110.—†*P. bronni*; STOLLEY (320) p. 256: Senonian, Caucasus; FOURNIER (85) pp. 159, 161.—†*P. censoriensis*; HUG (133) p. 405.—†*P. cingulatus*, Oxfordian, Caucasus; FOURNIER (85) p. 118: geogr. distrib., found in Posen; GALLINEK (93) p. 402.—†*P. jurensis*; STEFANO (316) p. 195.—*P. naresianus*, root; WACHSMUTH & SPRINGER (336) p. 51.—†*P. ornatus*; SCHLUETER (298) p. 946.—†*P. pentagonalis* (incl. *P. sigmaringensis*), geogr. distrib., found in Posen; GALLINEK (93) p. 401.—†*P.* aff. *peroni*; LORY & SAYN (197) p. 13.—†*P. psilonoti*; ROTHPLETZ (282) p. 35.—*P. rawsoni*; KOEHLER (163) p. 478.—*P.* cf. *scalaris*, Bajocian, Caucasus; FOURNIER (85) p. 110.—*P. wyville-thomsoni*, locomotion; WACHSMUTH & SPRINGER (336) p. 49.—*P.* sp., columnals in molasse of Angles no proof of depth; PELLAT (260) p. 114.

†*P. miocenicus*, Upper Burdigalian, between St. Etienne-du-Grés and Notre-Dame-du-Château (Bouches-du-Rhône), columnals only, compared

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with *P. müllleri*, *P. sowerbyi*, & *P. gastaldi*; LORIOL (194) Bull. Soc. geol. France (3) xxv, p. 127, pl. iv : n. sp.

Pentamera Ang.; WACHSMUTH & SPRINGER (336) p. 31.

†*Periechocrinites*; WACHSMUTH & SPRINGER (336) pp. 362, 366.

†*Periechocrinus*, rediagnosed, incl. *Trochocr.* Portlock, ? *Pradocr.* Verneuil, *Geocr.* d'Orb., *Saccocr.* Troost-Hall, *Pyxidocr.* (pars) Müller (p. 519), stem-lumen (p. 46); WACHSMUTH & SPRINGER (336).—*P. howardi* (olim *Saccocr.*), S. A. Miller, redescr. (p. 529); *P. infelix* (olim *Megistocr.* et *Saccocr.*) Winch. & Marcy, redescr., incl. *Saccocr. egani* S. A. Miller (p. 525, pl. l); *P. marcouanus* (olim *Megistocr.* et *Saccocr.*) Winch. & Marcy, redescr. (p. 523, pls. l & li); *P. necis*, redescr. (p. 524, pl. l); ? *P. ornatus* (olim *Saccocr.*) Hall, redescr., incl. *S. benedicti* S. A. Miller (p. 527, pls. l & li); *P. speciosus*, redescr. (p. 521, pl. l); *P. tennessensis* (olim *Saccocr.*) Hall, redescr., incl. *S. speciosus* Roem. non Hall (p. 528, pl. l); ? *P. tenuidiscus*, redescr. (p. 531, pls. xlvi, li); *P. urniformis* (olim *Saccocr.*) S. A. Miller, redescr. (p. 526, pl. l); ? *P. whitei*, redescr., incl. *Actinocr. amplus* M. & W. (p. 530, pls. xlvi, li); *P. whitfieldi* (olim *Saccocr.*) Hall, redescr., incl. *Actinocr. christyi* Hall non Shum. (p. 522, pl. li), arm-branching (p. 75); WACHSMUTH & SPRINGER (336).

†*Periglyptocrinus*, n. g., with genotype *P. billingsi*, Trenton limestone, Ottawa, Canada; WACHSMUTH & SPRINGER (336) p. 277, pl. xxi; arms (p. 80) : n. sp.

P. priscus (olim *Glyptocrinus*) Bill., redescr.; WACHSMUTH & SPRINGER (336) p. 278, pl. xxi.

†*Petalocrinidæ*, n. fam. (not defined) for *Petalocrinus*, n. g. (not diagnosed) with genotype *P. mirabilis* (p. 167), also *P.* (?) *major* (p. 170), both from Niagara limestone [near Monticello], Jones Co., Iowa; WELLER & DAVIDSON (341) J. Geol. iv, with figg. : n. spp.

†*Phialocrinus* Trautschold non Eichw., ? = *Graphiocr.*; WACHSMUTH & SPRINGER (336) p. 80.

†*Phillipsocrinus* M'Coy, an abnormal *Actinocrinoid*; WACHSMUTH & SPRINGER (336) p. 294.

†*Phimocrinus*, anal tube; WACHSMUTH & SPRINGER (336) p. 136.

†*Phyllocrinus patellæformis*; KILIAN (157) p. 682.

†*Physetocrinus*, rediagnosed (p. 593), arms (p. 85), tegmen (pp. 109, 120, pl. v); WACHSMUTH & SPRINGER (336).—*P. asper*, redescr. (p. 596, pl. lxiii); *P. copei*, redescr. (p. 598, pl. lxiii); *P. dilatatus*, redescr. (p. 595, pl. lxiv); *P. ornatus*, redescr., incl. *Actinocr. senarius* Hall et *A. brittsi* S. A. Miller (p. 597, pl. lxiii); *P. ventricosus*, redescr., incl. varr. *subventricosus* McChesney, *cancellatus* Hall, *internodius* Hall, *reticulatus* Hall (p. 593, pls. lxiii & lxiv); WACHSMUTH & SPRINGER (336).

P. lobatus, Lower Burlington age, Lake Valley, New Mexico; WACHSMUTH & SPRINGER (336) p. 599, pl. lxiii.—*P. sampsoni*, Burlington group, Sedalia, Mo.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 14, pl. i : n. spp.

Pinnastella T. & T. Austin; WACHSMUTH & SPRINGER (336) p. 16.

Pinnata, suborder of *Articulata*, defined; WACHSMUTH & SPRINGER (336) p. 152.

†*Pisocrinidæ*, defined, includes *Pisocr.* and *Triacr.*; ZITTEL (356) p. 125, and ZITTEL-EASTMAN (357) p. 135.

†*Pisocrinus*, base (p. 57), compound RR (p. 72), anal tube (p. 136); *P. pilula*, orals (p. 90); WACHSMUTH & SPRINGER (336).

†*Platycrinidæ*, Silurian and Devonian genera discussed, origin of the family; BATHER (30) p. 338: relation of arms to cup (p. 83), origin of fam. (p. 167), redefined, analysis and distribution of genera (p. 642); WACHSMUTH & SPRINGER (336): defined, includes *Platycr.*, *Marsupiocr.*,

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Culicocr. and *Cordylocr.*; ZITTEL (356) p. 127: also *Coccocr.*; ZITTEL-EASTMAN (357) p. 138.

†*Platycrinoidea* T. & T. Austin; WACHSMUTH & SPRINGER (336) p. 16.

†*Platycrinus*, rediagnosed and restricted, including *Centrocr.* et *Pleurocr.* Austin, et *Edwardsocr.* d'Orb., ontogeny (p. 647): stem (p. 40), its cirri (p. 41), its axial canal (p. 46), its joint-surfaces (p. 48), base (p. 57), arm-branching (pp. 77, 79), syzygies (p. 84), ambulacra (p. 102, pl. iv), tegmen (pp. 111 & 112), orals (p. 94); WACHSMUTH & SPRINGER (336): N. American spp. discussed; MILLER & GURLEY (232) p. 64.—*P. absentivus* S. A. Miller, not accepted (p. 650); *P. acclivus*, redescr. (p. 663); *P. æqualis*, redescr., incl. *P. batiola* S. A. Miller (p. 674, pl. lxxi); *P. æquiternus*, redescr., incl. *P. curryvillensis* Rowley & Hare (p. 658, pl. lxxi); *P. allophylus*, redescr. (p. 685, pl. lxxi); *P. altidorsatus* Rowley and Hare, not accepted (p. 650); *P. amabilis* S. A. Miller, not accepted (p. 650); *P. americanus*, redescr., incl. *P. truncatus* Hall, et ? *P. broadheadi* S. A. Miller (p. 686, pl. lxxv); *P. annosus* S. A. Miller, not accepted (p. 650); *P. asper* M. & W. non Goldf., redescr. (p. 690, pl. lxviii); *P. bedfordensis* Hall & White, not accepted (p. 650); *P. blairi* S. A. Miller, not accepted (p. 650); *P. bonoensis*, redescr., incl. *P. æternalis* et *P. caducus* S. A. Miller (p. 683, pl. lxix); *P. boonvillensis*, redescr. (p. 681, pl. lxxii); *P. brevinodus*, redescr. (p. 688, pl. lxx); *P. britsi*, redescr. (p. 659, pl. lxxi); *P. burlingtonensis*, ambulacrals (p. 103), redescr., incl. *P. inornatus* McChesney, *P. exsertus* Hall, *P. nodobrachiatus* Hall, *P. nucleiformis* Hall, & *P. lautus* S. A. Miller (p. 653, pl. lxix); *P. calyculus* Hall, not accepted (p. 650); *P. canaliculatus*, redescr. (p. 689, pl. lxxv); *P. cavus*, redescr. (p. 715, pl. lxvii); *P. chouteauensis*, *P. colletti* and *P. concinnus*, all of S. A. Miller, not accepted (p. 650); *P. contritus*, redescr. (p. 667, pl. lxxi); *P. corbuliformis*, redescr. (p. 657, pl. lxxi); WACHSMUTH & SPRINGER (336).—*P. crassus*; DORLODOT (71) p. 252.—*P. discoideus*, ambulacrals (p. 103), redescr., incl. *P. corrugatus* O. & S., *P. striobrachiatus* Hall, *P. multibrachiatus* M. & W., *P. shumardianus* Hall, & *P. pulchellus* S. A. Miller (p. 713, pl. lxvi); *P. eboraceus* Hall, not accepted (p. 650); *P. eminulus*, redescr. (p. 712, pl. lxviii); *P. eriensis*, redescr. (p. 676); *P. excavatus*, redescr., incl. *P. sulcatus* S. A. Miller (p. 718, pl. lxvi); WACHSMUTH & SPRINGER (336).—*P. formosus*, var., *approximatus*, n. var., Burlington group, Sedalia, Mo.; MILLER & GURLEY (233) p. 60, pl. v.—*P. glyptus*, redescr. (p. 693, pl. lxvii); *P. gorbyi*, redescr. (p. 716, pl. lxviii); *P. graphicus*, redescr., incl. *P. richfieldensis* Hall & White (p. 672, pl. lxxi); *P. halli*, ambulacrals (p. 103), redescr., incl. *P. planus* Hall non Ow. & Shum., et *P. olla* Hall non de Kon. (p. 662, pl. lxxii); *P. haydeni* Meek, not accepted (p. 650); *P. hemisphericus*, redescr. (p. 703, pl. lxvi); *P. huntsvillæ*, redescr., incl. *P. penicillus* M. & W., *P. plenus* M. & W., et *P. alabamensis* S. A. Miller (p. 678, pl. lxxiii); *P. incomptus*, redescr. (p. 664, pls. lxxi & lxxii); *P. insolens*, redescr. (p. 659, pl. lxxi); WACHSMUTH & SPRINGER (336).—*P. lævis*; DORLODOT (71) p. 252.—*P. lodensis*, redescr. (p. 666, pl. lxxi); *P. marginatus* Rowley & Hare, not accepted (p. 650); WACHSMUTH & SPRINGER (336).—*P. münsterianus*; DESTINEZ (66).—*P. niotensis*, redescr. (p. 682, pl. lxxi); *P. ollicula* redescr. after S. A. Miller (p. 667); *P. ornigranulus*, redescr., incl. *P. nodulosus* Hall non Goldf. (p. 701, pls. lxvi, lxviii); WACHSMUTH & SPRINGER (336).—*P. paradoxus* (olim *Palæchinus*) Eichw.; JAEKEL (144) p. 48.—*P. parvinodus*, redescr.; WACHSMUTH & SPRINGER (336) p. 696, pl. lxviii.—*P. parvus* Hall referred to *Clematocr.*; JAEKEL (144) p. 47.—*P. pentagonus* S. A. Miller, not accepted (p. 650); *P. pileiformis*, redescr., incl. *P. carchesium* S. A. Miller (p. 656, pls. lxix & lxx); *P. pisum*, redescr. (p. 660, pl. lxxi);

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P. plano-basalis Rowley & Hare, not accepted (p. 650); *P. planus*, redescr., incl. *P. bloomfieldensis* S. A. Miller (p. 668, pl. lxix); WACHSMUTH & SPRINGER (336).—*P.* cf. *planus*; DESTINEZ (66).—*P. plumosus* Hall, referred to *Clematocr.*; JAEKEL (144) p. 47: see *Cordylocr.*—*P. pocilliformis*, redescr. (p. 706, pl. lxviii); *P. pratteni*, redescr. (p. 671, pl. lxx); *P. pumilus* Hall, not accepted (p. 650); *P. quinquenodus*, redescr., incl. *P. planobasalis* Rowley & Hare (p. 661, pl. lxxi); WACHSMUTH & SPRINGER (336).—*P. ramulosus* Hall, referred to *Clematocr.*; JAEKEL (144) p. 47: vide etiam *Cordylocr.*—*P. regalis*, redescr., incl. *P. oweni* M. & W.; WACHSMUTH & SPRINGER (336) p. 710, pl. lxxii.—*P. retiarius*, referred to *Hapalocr.*; BATHER (30) p. 344.—*P. saffordi*, redescr. (p. 694, pl. lxvii); *P. sampsoni*, redescr. (p. 673, pl. lxx); *P. sarœ*, redescr., incl. *P. georgei* Hall, *P. prattenanus* M. & W., et *P. monroensis* Worthen (p. 677, pls. lxix & lxx); *P. scobina*, redescr., incl. *P. clytis* Hall (p. 695, pl. lxviii); *P. sculptus*, redescr., incl. *P. rotundus* S. A. Miller (p. 691, pls. lxviii, lxxv); WACHSMUTH & SPRINGER (336).—*P. spissus*; DORLODOT (71) p. 252.—*P. subspinosus*, redescr. (p. 717, pl. lxvi); *P. subspinulosus*, redescr. (p. 684, pls. lxvi, lxx); *P. symmetricus*, ambulacrals (p. 103), ridges on tegmen (p. 118), redescr. (p. 655, pls. iii, lxix); *P. tenuibrachiatus*, redescr. (p. 687, pl. lxx); *P. truncatulus*, redescr. (p. 675, pl. lxvii, lxxi); *P. verrucosus*, redescr. (p. 705, pls. lxvi, lxviii); *P. vexabilis* White, not accepted (p. 650); *P. wortheni*, redescr. (p. 702, pl. lxvii); *P. yandelli*, with var. *perasper*, redescr., incl. *P. nodobrachiatus* Hall 1861 non 1858 (p. 706, pls. lxvi, lxviii), ambulacrals (p. 103); WACHSMUTH & SPRINGER (336).

P. agassizi, Kinderhook group, Le Grand, Marshall Co., Ia., incl. *P. planus* W. & Sp. non Ow. & Shum.; WACHSMUTH & SPRINGER (336) p. 669, pl. lxix.—*P. bozemanensis*, Lower Carboniferous, Bridger Mts., Montana; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 42, pl. iii.—*P. bridgerensis*, *ibid.*, near Bozeman; *op. cit.* p. 43, pl. iii.—*P. concinnulus*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 63, pl. iv.—*P. davisi*, Lower Burlington Limest., Hannibal, Mo.; WACHSMUTH & SPRINGER (336) p. 684, pl. lxx.—*P. douglassi*, Lower Carboniferous, Bridger Mountains, Bozeman, Mont.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 86, pl. v.—*P. geometricus*, Upper Burlington Limest., Burlington, Ia.; WACHSMUTH & SPRINGER (336) p. 697, pls. lxvii & lxviii.—*P. hodgsoni*, Burlington Group, Adams Co., Ill.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 63, pl. v.—*P. illinoisensis*, *ibid.*; *op. cit.* p. 62, pl. v.—*P. nodostriatus*, Upper Burlington Limest., Burlington, Ia. (=*P. tenuibrachiatus* pars, M. & W.); WACHSMUTH & SPRINGER (336) p. 698, pls. lxvi, lxx.—*P. peculiaris*, Lower Burlington age, Lake Valley, New Mexico; *op. cit.* p. 700, pl. lxviii.—*P. sharonensis*, Burlington Group, near Sharon, S. W. Missouri; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 42, pl. iii.—*P. spinifer*, with var. nov. *elongatus*, Lower Burlington Limest., Burlington, Ia.; WACHSMUTH & SPRINGER (336) p. 708, pls. lxvi & lxvii.—*P. subscitulus*, Burlington Group, Sedalia, Mo.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 62, pl. iv: n. spp.

Plicatocrinidæ, defined, includes *Plicatocr.* & *Hyocr.*; ZITTEL (356) p. 143 and ZITTEL-EASTMAN (357) p. 171.

Polycrinides Pictet; WACHSMUTH & SPRINGER (336) p. 18.

Polymera Ang.; WACHSMUTH & SPRINGER (336) p. 31.

†*Polypeltes*, possibly a Batocrinid; WACHSMUTH & SPRINGER (336) p. 365.

†*Polypeltidæ*, defined, includes *Polypeltes* and *Spyridiocr.*; ZITTEL (356) p. 132: discontinued; ZITTEL-EASTMAN (357) p. 147.

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†*Porocrinus*, considered as link with Cystids (p. 146): related to *Hybocrinus* (p. 67); WACHSMUTH & SPRINGER (336).

†*Poteriocrinoidea* T. & T. Austin; WACHSMUTH & SPRINGER (336) p. 16.

†*Poteriocrinidæ*, tegmen; WACHSMUTH & SPRINGER (336) p. 116: defined, includes *Poteriocr.* (subgenn. *Scaphiocr.*, *Hydriocr.*, *Scytalocr.*, *Decadocr.*), *Woodocr.*, *Zeacr.*, *Cœliocr.*, *Hydreionocr.*, *Tribrachiocr.*, *Cromyocr.*, *Agassizocr.*, *Graphiocr.*, *Bursacr.*, *Phialocr.*, *Ceriocr.*, *Æsiocr.*, *Delocr.*, *Ulocr.*, *Erisocr.*, *Stemmatocr.*; ZITTEL (356) p. 136: many separated as *Encrinidæ*; ZITTEL-EASTMAN (357) p. 160.

†*Poteriocrinus*, not typical of *Poteriocrinidæ* (p. 87), anals (p. 126), anus (p. 137); WACHSMUTH & SPRINGER (336).—*P. clarkei*, var. *alpha*, and *P. cornellianus*; KINDLE (161) p. 34.—*P. crassus*, redescr. from various localities, Central France; JULIEN (151) p. 138, pl. xvii.—*P.* (*Decadocrinus*) *gregarius*; KINDLE (161) p. 34.—*P. labyrinthicus* (olim *Cyathocr.*) S. A. Miller, anal area now first described; MILLER & GURLEY (233) p. 34, pl. iv.—*P. missouriensis*, arm-branching; WACHSMUTH & SPRINGER (336) p. 78.—*P. plicatus*, from La Varville; JULIEN (151) p. 138, pl. v.—*P. radiatus*, La Varville, determined by De Koninck; JULIEN (151) p. 137.—*P. spissus*, redescr. from La Varville, determined by De Koninck; *loc. cit.*—*P. stellaris*; BEYER (38) p. 89, pl. iii, fig. 71.—*P.* (*Decadocrinus*) *zethus*; KINDLE (161) p. 34.

P. alberti, Kaskaskia Group, Monroe Co., Ill.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 29, pl. ii.—*P. arrectarius*, St. Louis Group, Alton, Ill.; *op. cit.* p. 33, pl. iv.—*P. batheri*, Pilton Beds, Devonshire; WHIDBORNE (342) P. Geol. Assoc. xiv, p. 377, no fig.—*P. bozemanensis*, Lower Carboniferous, Bridger mountains, Bozeman, Mont.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 82, pl. v.—*P. douglassi*, *ibid.*; *op. cit.* p. 83, pl. v.—*P. lautus*, Keokuk Group, Boonville, Mo.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 30, pl. ii.—*P. neglectus*, *ibid.*; *op. cit.* p. 31, pl. iv.—*P. pulaskiensis*, Kaskaskia Group, Pulaski Co., Ky.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 39, pl. iii.—*P. stadiodactylus*, Pilton Beds, Devonshire; WHIDBORNE (342) P. Geol. Ass. xiv, p. 377, no fig.—*P. tensus*, *ibid.*; *loc. cit.* no fig. : n. spp.

†*Pterotocrinus*, rediagnosed, incl. *Asterocr.* Lyon non Münst. (p. 791), arms and branching (pp. 77, 79), their relation to cup (p. 83), tegmen (p. 112); WACHSMUTH & SPRINGER (336).—*P. acutus*, redescr., incl. *P. spatulatus* Wetherby, et ? *P. rugosus* Ly. & Cass. (p. 799, pl. lxxix); var. *bifurcatus* (p. 801, pl. lxxix); *P. capitalis*, redescr. (p. 794, pl. lxxix), *P. chesterensis*, redescr. (p. 802, pl. lxxix); *P. coronarius*, redescr. (p. 795, pl. lxxix); *P. crassus*, redescr. (p. 801, pl. lxxix); *P. depressus*, redescr. (p. 796, pl. lxxix); *P. pyramidalis*, redescr. (p. 798, pl. lxxix); WACHSMUTH & SPRINGER (336).

†*Ptychocrinus*; JAMES (146): emended and diagnosed; WACHSMUTH & SPRINGER (336) p. 197.—*P. parvus* (including *P. angularis* and *Reteocrinus gracilis*), redescr. (p. 199, pl. xviii); *P. priscus*, referred to *Periglyptocrinus* (q. v.) (p. 198); *P. splendens*, redescr. (p. 198, pl. xviii); WACHSMUTH & SPRINGER (336).

Pycnocrinidées Pictet; WACHSMUTH & SPRINGER (336) p. 18.

†*Reteocrinidæ*, defined, with analysis of genera, & discussion; WACHSMUTH & SPRINGER (336) p. 173: defined; ZITTEL-EASTMAN (357) p. 144.

†*Reteocrinus*; JAMES (146): defined and discussed (p. 176), base (p. 67), tegmen (p. 120); WACHSMUTH & SPRINGER (336).—*R. cognatus*, probably large *R. onealli* (p. 177); *R. fimbriatus*, redescr. (p. 179, pl. ix); *R. gracilis* Wetherby, syn. of *Ptychocr. parvus* (pp. 177, 200); *R. magnificus*, redescr. (p. 181, pl. ix); *R. nealli* (= *onealli*), redescr., interradials discussed (p. 179, pl. ix); *R. stellaris*, redescr. (p. 178, pl. ix), arm-branching (p. 77); WACHSMUTH & SPRINGER (336).

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†*Rhaphanocrinus*, rediagnosed; WACHSMUTH & SPRINGER (336) p. 258.—*R. sculptus* (olim *Glyptocrinus*) S. A. Miller, redescr. (p. 260, pl. x); *R. subnodosus*, redescr. (p. 259, pl. xi); *R. wachsmuthi* Oehlert, "apparently not a typical form" (p. 259); WACHSMUTH & SPRINGER (336).

†*Rhipidocrinus*; FRECH (88) p. 177: arms and branching (pp. 76, 86); WACHSMUTH & SPRINGER (336).

Rhizocrinus, proximale (p. 39), stem (p. 40), its axial canals (p. 46), base (pp. 58, 62); WACHSMUTH & SPRINGER (336).—*R. rawsoni*; KOEHLER (164) p. 101: root; WACHSMUTH & SPRINGER (336) p. 51.

†*Rhodocrinidæ*, redefined, with analysis of genera, geological and geographical distribution; WACHSMUTH & SPRINGER (336) p. 215: defined, includes *Lyriocr.*, *Anthemocr.*, *Rhipidocr.*, *Thylacocr.*, *Ollacr.* (*Goniasteroidocr.*), *Rhodocr.* (*Acanthocr.*); ZITTEL (356) p. 130: add *Archæocr.* and *Diamenocr.*; ZITTEL-EASTMAN (357) p. 145.

†*Rhodocrinus*, including *Acanthocrinus*, rediagnosed and discussed; WACHSMUTH & SPRINGER (336) p. 218.—*R. asperatus* Bill., a doubtful *Archæocrinus* (p. 254); *R. barrisi*, with var. nov. *striatus*, Upper Burlington, Burlington, Ia., var. *divergens* Hall is only a mature form (p. 230, pl. xii); *R. benedicti*, description translated from S. A. Miller (p. 224); *R. cælatus* S. A. Miller, syn. of *R. nanus* (p. 228); *R. coxanus*, redescr. (p. 222, pl. xiii); WACHSMUTH & SPRINGER (336).—*R. echinatus* Schloth., see *Millericrinus*.—*R. gonatodes*, ? = *Diamenocr.*, arms (p. 80), *R. gracilis* Hall, not recognised (p. 220); *R. kirbyi*, redescr., with note on colour of fossils (p. 226, pl. xii), cirri (p. 44); *R. nanus*, redescr. (p. 288, pls. xi & xii), cirri (p. 44); *R. nodulosus*, redescr. (p. 225, pl. xiii); *R. parvus*, redescr. (p. 229); *R. rectus* Hall, not recognised (p. 220); *R. spinosus* and *R. varsoviensis* of Hall, not recognised (p. 220); *R. vesperalis* White, referred to *Diabolocr.* (p. 251); *R. wachsmuthi*, redescr. (p. 222, pls. xiii, xv); *R. watersianus*, redescr. (p. 221, pl. xii); *R. whitei*, including var. *burlingtonensis* as a large example, redescr. (p. 223, pl. xiii); *R. wortheni*, redescr. (p. 220, pls. xi & xii); *R. wortheni*, var. nov. *urceolatus*, Lower Burlington age, Lake Valley, New Mexico (p. 221, pl. xii); WACHSMUTH & SPRINGER (336).—*R.* (?) sp., cup-plates from Cornwall; COLLINS (54) p. 81, pl. E.

R. blairi, Chouteau limestone, Sedalia, Mo.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 37, pl. ii.—*R. bozemanensis*, Upper Burlington or Lower Keokuk Group, Bridger Mts., near Bozeman, Montana; MILLER & GURLEY (235), Bull. Illinois Mus. xii, p. 40, pl. iii.—*R. bridgerensis*, *ibid.*; *op. cit.* p. 41, pl. iii.—*R. douglassi*, *ibid.*; *op. cit.* p. 39, pl. iii.—*R. truncatus*, Upper Burlington Limestone, Burlington, Iowa; WACHSMUTH & SPRINGER (336) p. 231, pl. xiii.—*R. tuberculatus*, Lower Burlington age, Lake Valley, New Mexico; *op. cit.* p. 232, pl. xiii: n. spp.

†*Saccocoma*, plankton; WALTHER (338) p. 212.

†*Saccocomidæ*, defined, includes only *Saccocoma*; ZITTEL (356) p. 144, and ZITTEL-EASTMAN (357) p. 172.

†*Saccocrinus*:—*S. benedicti* S. A. Miller = *Periechocr. ornatus* (p. 527); *S. egani* S. A. Miller = *Periechocr. infelix* (p. 525); WACHSMUTH & SPRINGER (336).

†*Sagenocrinus*, base; WACHSMUTH & SPRINGER (336) p. 58.

†*Scaphiocrinus*, cirri (p. 44), arm-branching (p. 75), anus (p. 137); WACHSMUTH & SPRINGER (336).

S. notatus, Kinderhook Group, Le Grand, Iowa; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 36, pl. ii, n. sp.

†*Schizocrinus*, columns; WHITEAVES (344) p. 159: arm-branching; WACHSMUTH & SPRINGER (336) p. 77.

†*Scytalocrinus*, anus; WACHSMUTH & SPRINGER (336) p. 137.

Semiarticulata J. S. Miller; WACHSMUTH & SPRINGER (336) p. 13.

†*Siphonocrinus*, rediagnosed, has 5 not 3 IBB (p. 209), tegmen (p. 122);

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WACHSMUTH & SPRINGER (336).—*S. armosus*, redescribed (p. 211, pl. xix), tegmen (p. 107, pl. xix); *S. nobilis*, redescribed (p. 212, pl. xix); WACHSMUTH & SPRINGER (336).

S. pentagonus, Upper part of Niagara group, Racine, Greenfield, and Waukesha, Wisc., and Chicago, Ill.; WACHSMUTH & SPRINGER (336) p. 213, pl. xix, n. sp.

†*Sphærocrinus*; FRECH (88) p. 177.

Sphæroidocrinoidea T. & T. Austin; WACHSMUTH & SPRINGER (336) p. 16.

†*Spyridiocrinus*, possibly a Batocrinid; WACHSMUTH & SPRINGER (336) p. 365.

†*Steganocrinus*, rediagnosed (p. 579), arms and branching (pp. 76, 85), ambulacrals (p. 101), tegmen (p. 110); WACHSMUTH & SPRINGER (336).—*S. araneolus*, redescr. (p. 581, pl. lxi); *S. concinnus*, redescr., incl. *Actinocr. validus* M. & W. (p. 581, pl. lxi); *S. pentagonus*, second anal tube (p. 136), axial canals in cup (p. 142), redescr. (p. 579, pl. lxi); *S. sculptus*, arm-branching (pp. 75, 78), redescr. (p. 583, pl. lxi); WACHSMUTH & SPRINGER (336).

S. albersi, Burlington Group, Burlington, Ia.; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 33, pl. ii.—*S. blairi*, Burlington Group, near Sharon, S. W. Missouri; *op. cit.* p. 35, pl. ii.—*S. globosus*, Kinderhook group, Burlington, Ia.; WACHSMUTH & SPRINGER (336) p. 585, pl. lxi.—*S. griffithi*, Burlington Group, Burlington, Ia.; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 34, pl. ii.—*S. sharonensis*, Burlington Group, near Sharon, S. W. Missouri; *op. cit.* p. 32, pl. ii.—*S. spergenensis*, St. Louis Group, Spergen Hill, Ind.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 29, pl. ii: n. spp.

†*Stelidiocrinus*, rediagnosed, based on *S. capitulum* and *S. lævis* Ang., pl. xv, fig. 20 (p. 279), arm-branching (p. 79); (?) *S. argutus*, redescr. (p. 280, pl. xxiv); *S. lævis* Ang., pl. xxviii, fig. 7 is a *Desmidocr.* (p. 280); *S. ovalis* Ang. is a Rhodocrinid (p. 280); WACHSMUTH & SPRINGER (336).

†*Stemmatocrinus*, base (p. 59), arms (p. 80), anals (p. 133); WACHSMUTH & SPRINGER (336).

†*Stephanocrinidæ*, defined, includes only *Stephanocr.*; ZITTEL (356) p. 125, & ZITTEL-EASTMAN (357) p. 137.

†*Stereocrinus*, rediagnosed (p. 324), arm-branching (p. 77); *S. triangulatus*, redescr. (p. 325, pl. xxv); WACHSMUTH & SPRINGER (336).

S. barrisi, Hamilton Group, Alpena, Mich., based on *S. triangulatus* Barris pars; WACHSMUTH & SPRINGER (336) p. 326, pl. xxv.—*S. indianensis*, Hamilton Group, near Charlestown, Ind.; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 38, pl. iii: n. spp.

Stomatocrinoidea W. & Sp.; WACHSMUTH & SPRINGER (336) pp. 25, 148.

†*Storthingocrinus*, base; WACHSMUTH & SPRINGER (336) p. 57: discussed, placed near *Pisocr.* rather than *Symbathocr.*, structure of base; OEHLERT (250) p. 822.

S. haugi, Lower Devon., Sta. Lucia, Spain, supposed [erroneously] not to agree with structure of *S. fritillus* in respect of small basal; OEHLERT (250) Bull. Soc. geol. France (3) xxiv, p. 821, pl. xxvi: n. sp.

†*Strotocrinus*, rediagnosed, incl. *Calathocr.* (pars) Hall non v. Meyer (p. 637), arms and branching (pp. 76, 85), tegmen (p. 110), convoluted organ (p. 143, pl. v); WACHSMUTH & SPRINGER (336): includes *Teleiocr.*; MILLER & GURLEY (232) p. 32.—*S. glyptus*, redescr. (p. 640, pls. lx, lxv); *S. regalis*, stem (p. 39), arm-branching (p. 75), redescr., incl. *Actinocr. perumbrosus* Hall, *A. speciosus* M. & W., *S. bloomfieldensis* S. A. Miller (p. 638, pl. lxv); WACHSMUTH & SPRINGER (336).

S. ornatus, Burlington Group, Burlington, Iowa; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 30, pl. ii: n. sp.

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Stylida C. F. Roem.; WACHSMUTH & SPRINGER (336) p. 17.

†*Symbathocrinidæ*, defined, includes *Symbathocr.*, *Phimocr.*, *Stylocr.*, *Stortingocr.*, and *Lageniocr.*; ZITTEL (356) p. 125, and ZITTEL-EASTMAN (357) p. 136.

†*Symbathocrinus*, base (p. 57), orals (pp. 89, 91, pl. iii), muscle-plates (p. 87), anal tube (pp. 136, 157); *S. wachsmuthi*, arm (p. 75); WACHSMUTH & SPRINGER (336).

S. illinoisensis, Burlington Group, Adams Co., Ill.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 53, pl. iii : n. sp.

†*Synerocrinus*, n. g., with genotype *Forbesiocrinus incurvus* Trautsch.; JAEKEL (144) p. 47.

†*Talarocrinus*, rediagnosed (p. 781), arms and branching (pp. 77, 79); WACHSMUTH & SPRINGER (336).—*T. cornigerus*, redescr. (p. 783, pl. lxxviii); *T. ovatus*, redescr. (p. 787, pl. lxxviii); *T. sexlobatus*, redescr. (p. 784, pl. lxxviii); *T. simplex* (olim *Dichocr.*) Shum., redescr. (p. 790, pl. lxxviii); *T. symmetricus*, redescr., incl. *Dichocr. elegans* Ly. & Cass. (p. 786, pl. lxxviii); WACHSMUTH & SPRINGER (336).

T. decornis, Upper part of St. Louis Group, Tateville, Pulaski Co., Ky., an incl. *Dichocr. constrictus*, M. & W. ?; WACHSMUTH & SPRINGER (336) p. 788, pl. lxxviii.—*T. patei*, Kaskaskia Group, Breckenridge Co., Ky.; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 44, pl. iii.—*T. subglobosus*, Upper part of St. Louis Group, Tateville, Pulaski Co., Ky.; WACHSMUTH & SPRINGER (336) p. 789, pl. lxxix: n. spp.

†*Tanaocrinus*, n. g., with genotype *T. typus*, Hudson River Group, Warren Co., O. (p. 185, pl. ix), base (p. 67); WACHSMUTH & SPRINGER (336): n. sp.

†*Taxocrinidæ*, types of arm-branching; JAEKEL (144) p. 46.

†*Taxocrinus*, stem (p. 43), base (p. 58), anal tube (p. 138), arm-branching (p. 77), tegminal food-grooves (p. 101, pl. iii), orals (p. 93, pl. iii); WACHSMUTH & SPRINGER (336).—*T. curtus*; KINDLE (161) p. 34.—*T. intermedius*, ridges on tegmen; WACHSMUTH & SPRINGER (336) p. 118, pl. iii.—*T. ithacensis* (p. 33), var. *alpha* (p. 34); KINDLE (161).—*T. macrodactylus*; WHIDBORNE (342) p. 377.—*T. multibrachiatus*, var. *colletti* White, made a distinct sp. of *Taxocr.*; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 56.—*T. thiemei*, anals and interbrachials; WACHSMUTH & SPRINGER (336) p. 139.

T. splendens, Keokuk Group, Crawfordsville, Ind.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 61, pl. v.—*T.* (?) *stultus*, Pilton Beds, Devonshire; WHIDBORNE (342) P. Geol. Ass. xiv, p. 377, no fig.—*T. ungula*, Keokuk Group, Crawfordsville, Ind.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 59, pl. v: n. spp.

†*Technocrinus*, rediagnosed (p. 304); *T. andrewsi*, redescr. (p. 306, pl. xxiv); *T. spinulosus*, redescr. (p. 305, pl. xxii); *T. striatus* (p. 305); WACHSMUTH & SPRINGER (336).

†*Teleiocrinus*, rediagnosed, incl. *Calathocr.* Hall pars, non v. Meyer, & *Strotocrinus*, sect. B, M. & W. (p. 626), arms (p. 85), ambulacra (p. 102, pl. iv), convoluted organ (p. 143, pl. v); WACHSMUTH & SPRINGER (336): considered syn. of *Strotocr.*; MILLER & GURLEY (232) p. 32.—*T. althea*, redescr. (p. 632, pls. lx, lxiii); *T. liratus*, redescr., incl. *Actinocr. subumbrosus* Hall (p. 633, pl. lx); *T. rudis*, tegmen (p. 107, pl. v), redescr., incl. *Actinocr. clivosus* Hall, *A.* (*Calathocr.*) *erodus* Hall, *A.* (*Calathocr.*) *insculptus* Hall (p. 630, pl. lix); *T. tenuiradiatus*, redescr. (p. 634, pl. lix); *T. umbrosus*, abnormal base (p. 56), second anal tube (p. 136), redescr., incl. *Actinocr. ægilops* Hall, et *A. delicatus* M. & W. (p. 628, pls. lix & lx); WACHSMUTH & SPRINGER (336).

T. adolescens, Lower Burlington Limest., Burlington, Ia., an incl. *Actinocr.*

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penicillus, M. & W.?; WACHSMUTH & SPRINGER (336) p. 635, pl. lix: n. sp.

Tessellata Joh. Müller (p. 15), of Zittel (p. 23); WACHSMUTH & SPRINGER (336).

Tetramera Ang.; WACHSMUTH & SPRINGER (336) p. 31.

†*Thallocrinus*, discussed, a syn. of *Hapalocrinus* (q. v.); BATHER (30) p. 343.—*T. retiarius*, referred to n. g. *Clematocr.*; JAEKEL (144) p. 47.

Thaumatocrinus, interradials (p. 72), interbrachials (p. 117), anals (p. 139); WACHSMUTH & SPRINGER (336).

†*Thiollericrinus flexuosus*, *T. Heberti*, Tithonian, Bas-Languedoc; ROMAN (281) pp. 88, 331.

†*Thylacocrinus*, rediagnosed; WACHSMUTH & SPRINGER (336) p. 248.

T. clarkei, Hamilton group, Canandaigua Lake, N. Y.; WACHSMUTH & SPRINGER (336) p. 248, pl. xiii : n. sp.

†*Thysanocrinidæ*; ZITTEL-EASTMAN (357) p. 145: (= *Glyptasteridæ*) [= *Dimerocrinidæ*], defined, analysis of genera, distribution, affinities; WACHSMUTH & SPRINGER (336) p. 188.

†*Thysanocrinus*, 1852, substituted for *Dimerocrinus*, 1836, and including *Glyptaster* and *Eucrinus*, defined; WACHSMUTH & SPRINGER (336) p. 190.—*T. brachiatus* (olim *Glyptaster*), redescr. (p. 195, pl. xviii); (?) *T. halli* (olim *Rhodocr.*), redescr. (p. 196, pl. xiii); *T. inornatus* (olim *Glyptaster*), redescr., infrabasals discussed (p. 193, pls. xviii & xix); WACHSMUTH & SPRINGER (336).—*T. immaturus*, see *Idiocrinus*.—*T. liliiformis*, redescr. (p. 192, pl. xviii); *T. occidentalis* (olim *Glyptaster*), redescr., its var. *increbrescens* not admitted (p. 194, pl. xviii); WACHSMUTH & SPRINGER (336).

T. milliganæ, Niagara group, Decatur Co., Tenn.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 51, pl. iii : n. sp.

†*Tiaracrinus*; WACHSMUTH & SPRINGER (336) p. 146.

†*Trematocrinus*, syn. of *Gilbertsocr.* (p. 237); *T. papillatus* Hall, mere variation of *Gilbertsocr. typus* (p. 243); WACHSMUTH & SPRINGER (336).

†*Triacrinus*, base; WACHSMUTH & SPRINGER (336) p. 57.

†*Tribrachiocrinus*, compound radials [!]; WACHSMUTH & SPRINGER (336) p. 158.

Trimera Ang.; WACHSMUTH & SPRINGER (336) p. 31.

†*Turbinocrinus* Hall ex Troost, syn. of *Melocrinus*; WACHSMUTH & SPRINGER (336) p. 294.

†*Uintacrinidæ*, defined, includes only *Uintacr.*; ZITTEL (356) p. 138, and ZITTEL-EASTMAN (357) p. 165.

†*Uintacrinus*, horizon and locality in Kansas; WILLISTON (348) p. 110: distribution; BATHER (25): nekton or plankton; WALTHER (338) p. 222.—*U. socialis*, redescr., origin of genus discussed; BATHER (24): colony of young, Elkader, Kansas; WILLISTON (349) p. 242.—*U. westfalicus*, believed identical with *U. socialis*; *op. cit.* p. 243.

†*Ulocrinus*, anals; WACHSMUTH & SPRINGER (336) p. 133.

†*Xenocrinus*; JAMES (146): redefined, interradials discussed (p. 182), base (p. 67); WACHSMUTH & SPRINGER (336).—*X. baeri*, redescribed (p. 185, pl. ix); *X. penicillus*, redescribed, interradials discussed (p. 183, pl. ix); WACHSMUTH & SPRINGER (336).

†*Zeacrinus*, base; WACHSMUTH & SPRINGER (336) p. 52.—*Z. excavatus* Schultze, referred to *Dactylocr.*; JAEKEL (144) p. 47.

Z. doverensis, Kaskaskia group, Dover Hill, Ind.; MILLER & GURLEY (232) Bull. Illinois Mus. viii, p. 35, pl. ii.—*Z. kentuckiensis*, Kaskaskia group, Pulaski Co., Ky.; *op. cit.* p. 37, pl. ii.—*Z. peculiaris*, *ibid.*; *op. cit.* p. 34, pl. ii : n. spp.

†*Zophocrinus*; WACHSMUTH & SPRINGER (336) p. 146.

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(G.)—†CYSTIDEA.

Defined and restricted by removal of *Amphoridea* (p. 443), classified (p. 551); HAECKEL (116).—Defined (p. 72), and classified (p. 73), system (p. 77), structure discussed (p. 78); the genera of Barrande "Syst. Silur. de Bohême" vol. vii referred to genera, sub-families, and families of Haeckel (p. 166); HAECKEL (118).—Haeckel's definition discussed; GREGORY (109) p. 128.—Classification; JAEKEL (143).

General account and synopsis of chief genera; KOKEN (171) p. 288.—General account, no Orders recognised, but Families *Aristocystidæ*, *Camarocystidæ*, *Echinosphæritidæ*, *Cryptocrinidæ*, *Caryocrinidæ*, *Anomalocystidæ*, *Callocystidæ*, *Agelacrinidæ*; ZITTEL (356) p. 148, and ZITTEL-EASTMAN (357) p. 177.

Acanthocystida, sub-fam. nov. of *Palæocystida*, for *Acanthocystis* and *Archæocystis*; HAECKEL (118) p. 64.

Acanthocystis; HAECKEL (117) p. 402: redefined; HAECKEL (118) p. 70: "has long been preoccupied among Protozoa by Carter" [to be precise, since 1863]; GREGORY (109) p. 133.—*A. briareus*, redescribed; HAECKEL (118) p. 71, pl. i.

Achradocystis, redefined and made to include *Cyclocrinus* Eichw. [which is no Echinoderm], *A. grewingkii*, redescribed; HAECKEL (118) p. 56.

Agelacrinidæ, defined, includes *Agelacr.* (subgenn. *Lepidodiscus*, *Hemicystis*, *Cytaster*, *Edrioaster*), *Mesites*, *Asteroblastus*, ? *Tiaracr.*; ZITTEL (356) p. 157, and ZITTEL-EASTMAN (357) p. 187.

Agelacrinus; HAECKEL (117) p. 401: redefined (p. 112); *A. buchianus*, referred probably to *Edriocystis* (p. 113); *A. dicksoni* (p. 113); *A. verticellatus*, redescribed (p. 112, pl. iii); HAECKEL (118).

Agelacystida or *Agelacrinida*; HAECKEL (117) p. 401.—*Agelacystida*, fam. nov., including sub-famm. *Hemicystida* and *Asterocystida*; HAECKEL (118) pp. 77, 107.

Agelacystis, n. g., with genotype *A. hamiltonensis* [which unfortunately is genotype of *Agelacrinus*]; HAECKEL (117) p. 401, & (118) p. 114, pl. iii.

Amorphocystis, n. g., with genotype "*Caryocystis testudinarius*, v. Buch." [non Hisinger] and including *C. pumilus*, Eichw.; JAEKEL in KOKEN (171) p. 411, footnote: name unnecessary, Review in Nat. Sci.

Amphoracystis, n. g., with type *A. irregularis* (olim *Deutocystis*) Barr., described and figured; HAECKEL (118) p. 52.

Amphoræa, hypothetical ancestral genus; HAECKEL (118) p. 31.

Amphoralia, subclass of *Amphoridea* (=*Amphoridea bilateralia*); HAECKEL (116) p. 429: defined; HAECKEL (118) p. 12.

Amphoridea, removed from Cystidea as a new Class, defined (p. 423), their system in a table (p. 430); HAECKEL (116): proposed as Class; HAECKEL (117) p. 394: defined (p. 9), classified (p. 11); HAECKEL (118).

Amphoronia, subclass of *Amphoridea* (=*Amphoridea monaxonia*); HAECKEL (116) p. 429: defined; HAECKEL (118) p. 12.

Amygdalocystis, redefined, *A. florealis*, redescribed; HAECKEL (118) p. 106.

Anomalocystidæ defined, includes *Trochocystis*, *Mitrocystis*, *Anomalocystis*, *Balanocystis*, *Dendrocystis*, *Pleurocystis*; ZITTEL (356) p. 156, & ZITTEL-EASTMAN (357) p. 185.

Anomocystida or *Pleurocystida*; HAECKEL (117) p. 398.—*Anomocystida*, defined as including *Anomalocystida* and *Pleurocystida*, and fully discussed; HAECKEL (118) pp. 12, 33.

Anomocystis, nom. nov. pro *Anomalocystis* Hall; HAECKEL (117) p. 398: redefined; HAECKEL (118) p. 40.—*A. cornuta*, and *A. disparilis*, redescribed; HAECKEL (118) p. 41, pl. ii.

Anthocystida, sub-fam. nov. of *Callocystida*; HAECKEL (118) p. 129.

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Anthocystis, n. g., with genotype *A. halliana*, Niagara group, N. America, based on Hall's pl. l, figg. 1–11 [which really represent the type of *C. jewetti*, genotype of *Callocystis*]; HAECKEL (118) p. 132: n. sp.

Apiocystida, sub-fam. nov. of *Callocystida*; HAECKEL (118) p. 129.

Apiocystis; HAECKEL (117) p. 401: redefined (p. 132); *A. elegans* (p. 133); *A. pentremitoides*, redescribed (p. 132, pl. iii); HAECKEL (118).

Aporita, criticised; HAECKEL (118) p. 19.

Arachnocystis; HAECKEL (117) p. 397: redefined (p. 64); *A. infausta*, redescribed (p. 65, pl. i); HAECKEL (118).

Archæocystida or *Protamphorida*, hypothetical family; HAECKEL (117) p. 396.

Archæocystis, nom. nov., hypothetical genus; HAECKEL (117) p. 396: redefined, and *A. medusa* described; HAECKEL (118) p. 71, pl. i.

Aristocystida or *Caryocystida* Haeckel non Neumayr (= *Holocystida*); HAECKEL (117) p. 397: defined and discussed; HAECKEL (118) pp. 12, 45.

Aristocystidæ, defined, includes *Aristocystis*, *Deutocystis*, *Craterina*, *Pyrocystis*; ZITTEL (356) p. 152, & ZITTEL-EASTMAN (357) p. 182.

Aristocystis; HAECKEL (117) p. 397: redefined, and *A. bohemica* redescribed; HAECKEL (118) p. 50, pl. ii.

Ascocystida or *Ascothuria*, fam. nov.; HAECKEL (117) p. 402, & (118) pp. 77, 119.

Ascocystis; HAECKEL (117) p. 402: defined and discussed (pp. 121, 124); *A. drabowiensis* (p. 125); HAECKEL (118).

Asteroblastus, redefined, and *A. stellatus*, redescribed, and compared with *A. volborthi*; HAECKEL (118) p. 117, pl. iii.

Asterocystis, n. g., with genotype *A. tuberculata* (olim *Asteroblastus*) Schmidt; HAECKEL (118) p. 116, pl. iii.

Asterocystida, sub-fam. of *Agelacystida*; HAECKEL (118) p. 111.

Astroblastus; HAECKEL (117) p. 401.

Astrocystites, n. g. [posterior to *Asterocystis* HAECKEL, v. supra], with genotype *A. ottawaensis*, Trenton Limest., Division St., Ottawa, "most nearly related to *Asteroblastus*"; WHITEAVES (345) p. 287, and figg.: n. sp.

Atelocystida, sub-fam. nov. of *Anomocystida*; HAECKEL (118) p. 37.

Atelocystis; HAECKEL (117) p. 398: redefined; HAECKEL (118) p. 41.

A. gegenbauri, Upper Silurian, Wenlock Limestone, Dudley [syn. of *Placocystis forbesianus*]; HAECKEL (118) p. 42, pl. ii: n. sp.

Calix Rouault, syn. of *Craterina*; HAECKEL (118) p. 54.

Callocystida or *Apiocystida*; HAECKEL (117) p. 401.—*Callocystida*, redefined, incl. sub-famm. *Anthocystida*, *Apiocystida*, and *Pseudocrinida*; HAECKEL (118) pp. 77, 125.—*Callocystidæ*, defined, includes *Pseudocr.*, *Lepadocr.*, *Apiocystis*, *Callocystis*, ? *Hybocystis*; ZITTEL (356) p. 156, & ZITTEL-EASTMAN (357) p. 186.

Callocystis; HAECKEL (117) p. 401: redefined, and *C. jewettii* redescribed on basis of Hall's pl. l, figg. 12–18 [which Hall expressly makes a var. and not the type: see *Anthocystis*] (p. 131, pl. iii), *C. multipora* (p. 132); HAECKEL (118).

Camarocystidæ, defined, includes *Camarocr.* & *Lichenocr.*; ZITTEL (356) p. 154, & ZITTEL-EASTMAN (357) p. 183.

Caryocrinidæ, defined, includes *Hemicosmites*, *Caryocr.*, *Echinoencr.*, *Glyptocystis*, *Homocystis*, *Mimocystis*; ZITTEL (356) p. 155, & ZITTEL-EASTMAN (357) p. 184.

Caryocrinus, redefined; HAECKEL (118) p. 143.—*C. ornatus*, redescribed; HAECKEL (118) p. 144, pl. iv: coil of gut inferred from sections; JAEKEL (142) p. 31.

C. hammelli, Niagara Group, Madison Co., Ind.; MILLER & GURLEY (233) Bull. Illinois Mus. ix, p. 65, pl. v.—*C. milliganæ*, Niagara Group, Decatur Co., Tenn.; *op. cit.* p. 63, pl. v: n. spp.

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Caryocystis; HAECKEL (117) p. 397: redefined; HAECKEL (118) p. 59.—*C. alutacea*, vide sub *Heliopirum*.—*C. geometrica* and *C. granatum*, vide sub *Heliocrinum*.—*C. ovalis*, vide sub *Heliopirum*.—*C. prominens*, vide sub *Heliocrinum*.—*C. tenuistriata*, vide sub *Heliopirum*.—*C. testudinaria*, Buch et Auctt. [non Hisinger], redescribed; HAECKEL (118) p. 59, pl. ii: made type of n. g. *Amorphocystis*; JAEKEL in KOKEN (171) p. 411, footnote.

C. angelini, based on Angelin, pl. xiii, figg. 4–9 [which represent the original specimen of Hisinger, to which the name *testudinarius* is (quite erroneously) applied by all authors, Haeckel included; *angelini* therefore becomes genotype: see Zool. Rec. 1893]; HAECKEL (118) p. 59: n. sp.

Chirocrinus, syn. of *Glyptocystis*; HAECKEL (117) p. 402.

Citrocystida, sub-fam. nov. of *Palæocystida*, for *Echinosphæra*, *Citrocystis*, and *Palæocystis*; HAECKEL (118) p. 64.

Citrocystis, n. g., with type *Citrocystis citrus* (olim *Sphæronites*) Hisinger; HAECKEL (118) p. 68, pl. i.

Comarocystida, sub-fam. nov. of *Palæocystida*; HAECKEL (118) p. 64.

Comarocystis; HAECKEL (117) p. 397: redefined, and *C. punctata* redescribed; HAECKEL (118) p. 70, pl. i.

Craterina, incl. *Calix* Rouault, redefined, and *C. bohemica*, incl. *C. excavata* Barr., redescribed; HAECKEL (118) p. 54.

Crinocystis chrysalis Hall, doubtfully referred to *Palæocystis*; HAECKEL (118) p. 69.

Cryptocrinidæ, defined, includes *Cryptocr.*, *Echinocystis*, *Porocr.*, *Hypocr.*; ZITTEL (356) p. 154, and ZITTEL-EASTMAN (357) p. 184.

Cryptocrinus, redefined (p. 146), and *C. cerasus*, redescribed (p. 147); HAECKEL (118).

Crystallocystis Haeckel (="Echinosphæra sensu strictissimo!"); HAECKEL (118) p. 66. [? n. g.]

Cyathocystis, redefined, and *C. plautinæ*, redescr.; HAECKEL (118) p. 115.

Cystidea concomitans, vide *Stromatocystis*.

Cystoblastus, as ancestor of *Blastoidea*; JAEKEL (141): redefined, and *C. leuchtenbergii* redescribed; HAECKEL (118) p. 130.

Decamphora, nom. nov., hypothetical ancestor of hypothetical *Protamphora*; HAECKEL (118) p. 33.

Dendrocystis; HAECKEL (117) p. 397: redefined (p. 54), and *D. sedgwicki* redescribed (p. 55, pl. ii); HAECKEL (118).

Deutocystis; HAECKEL (117) p. 397: redefined, and *D. modesta* redescribed; HAECKEL (118) p. 51, pl. ii.

Diploporita, criticised; HAECKEL (118) p. 19.

Discocystis, nom. nov. pro *Echinodiscus* Worthen & Miller non Agassiz; GREGORY (109) p. 131.—*D. optatus* is an Agelacrinid, and the genus is of doubtful validity; BATHER (31).

Echinocystis; BATHER (31).—*Echinocystis* Hall non Wyv.-Thoms., redefined; HAECKEL (118) p. 146.—*E. armata* (olim *Echinoencrinus*) Forbes, made type of *Echinocystis* Hall [with which it is not congeneric, and already is type of *Schizocystis* Jaekel]; HAECKEL (118) p. 146.

Echinoencrinus, syn. of *Glyptocystis*; HAECKEL (117) p. 402.—*E. baccatus*, referred to *Echinocystis*; HAECKEL (118) p. 146.

Echinosphæra; HAECKEL (117) p. 397: redefined; HAECKEL (118) p. 66.—*E. baltica* and *E. aranea*, vide sub *Heliocrinum*.—*E. aurantium*; JAEKEL (143) p. 389: redescribed; HAECKEL (118) p. 67, pl. i.

Echinosphæritidæ, defined, includes *Echinosphæra*, *Arachnocystis*, *Carycocystis*, *Orocystis*, *Palæocystis*; ZITTEL (356) p. 154, and ZITTEL-EASTMAN (357) p. 183.

Edriocystis, nom. nov. pro *Edrioaster*; HAECKEL (118) p. 133.—*E. bigsbyi* (olim *Edrioaster*), redescribed; HAECKEL (118) p. 118, pl. iii.

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Enneacystis, n. g., with genotype *E. buchiana*, based on *Caryocr. ornatus* with 9 brachioles, Ordovician, Russia; HAECKEL (118) p. 143, pl. iv: n. sp.

Eocystida (= *Protamphorida*), defined (p. 12): defined and classified "als heuristische Hypothese"; HAECKEL (118) p. 30.

Eocystis Haeckel non Billings nec Walcott, hypothetical ancestral genus; HAECKEL (118) p. 31.

Eucystis; HAECKEL (117) p. 401: redefined; HAECKEL (118) p. 99.—*E. rariporata*, redescribed; HAECKEL (118) p. 100.

Fungocystida or *Glyptosphærida*; HAECKEL (117) p. 401.—*Fungocystida*, fam. nov., including sub-famm. *Glpytosphærida* and *Malocystida*; HAECKEL (118) pp. 77, 101.

Fungocystis; HAECKEL (117) p. 401: redefined; HAECKEL (118) p. 104.—*F. rarissima*, redescribed, with restored figure, showing tentacles; HAECKEL (118) p. 105.

Glyptocystida (= *Caryocrinida* pars); HAECKEL (117) p. 402: redefined, including sub-famm. *Hexalacystida* and *Sycocystida*; HAECKEL (118) pp. 77, 136.

Glyptocystidæ, coil of gut inferred from varying positions of anus; JAEKEL (142) p. 34.

Glyptocystis (= *Chirocrinus*); HAECKEL (117) p. 402: redefined, incl. *Chirocrinus* Eichw.; HAECKEL (118) p. 150.—*G.* cf. *logani*; GARDINER, REYNOLDS, & REED (95) pp. 524, 538.—*G. multipora* Billings referred to *Callocystis*; HAECKEL (118) p. 132.—*G. pennigera*, redescr.; HAECKEL (118) p. 150, pl. iv.—*G.* sp., plates; WHITEAVES (344) p. 159.

Glyptosphæra; HAECKEL (117) p. 401: redefined, and *G. leuchtenbergi*, redescribed; HAECKEL (118) p. 103.

Gomphocystis; HAECKEL (117) p. 401: redefined, and *G. tenax* redescribed; HAECKEL (118) p. 115, pl. iii.

Haplocystis Roem., referred to *Lepidodiscus*; HAECKEL (118) p. 113.

Haploporita, criticised; HAECKEL (118) p. 19.

Heliocrinum, subgen. nov. of *Heliocystis* for *Caryocystis granatum*, *Echinosphæra baltica*, *E. aranea*, *Caryocystis prominens*, and *C. geometrica*; HAECKEL (118) p. 58.

Heliocrinus, vide sub *Heliocystis*.—*H. radiatus*, vide sub *Heliopirum*.

Heliocystis, nom. nov. pro *Heliocrinus* Eich., redefined, and *H. radiata* redescribed; HAECKEL (118) p. 58, pl. ii.

Heliopirum, subgen. nov. of *Heliocystis* for *Heliocrinus radiatus*, *Caryocystis ovalis*, *C. tenuistriata*, and *C. alutacea*; HAECKEL (118) p. 59.

Hemicosmites, redefined; HAECKEL (118) p. 141.—*H. piriformis*, redescribed; HAECKEL (118) p. 142, pl. iv.

Hemicystida, subfam. of *Agelacystida*; HAECKEL (118) p. 110.

Hemicystis; HAECKEL (117) p. 401: redefined; HAECKEL (118) p. 111.—*H. granulata*, redescribed; HAECKEL (118) p. 112, pl. iii.

Hexalacystida (= *Caryocrinidæ*), subfam. nov. of *Glyptocystida*; HAECKEL (118) p. 140.

Hexalacystis, n. g., with genotype *H. verrucosa* (olim *Hemicosmites*) Eichw., redescribed; HAECKEL (118) p. 142, pl. iv.

Holocystis Hall non Lonsdale (*Megacystis* Hall); HAECKEL (117) p. 397: redefined, and *H. cylindrica* redescribed; HAECKEL (118) p. 60.

Homocystis; HAECKEL (117) p. 402: redefined; HAECKEL (118) p. 149.—*H. altera*, redescribed; HAECKEL (118) p. 150, pl. iv.

Hypocrinus, redefined, and *H. schneideri*, redescribed; HAECKEL (118) p. 147.

Lapillocystis fragilis, referred to *Palamphoridæ*; HAECKEL (118) p. 33.

Lepadocrinus; HAECKEL (117) p. 401: redefined; HAECKEL (118) p. 134.—*L. gebhardi*, redescribed; HAECKEL (118) p. 135, pl. iii.—*L. quadrifasciatus*, restored figure; BATHER (28) p. 101.

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Lepidodiscus, redefined, incl. *Haplocystis*, and *L. cincinnatiensis* redescribed; HAECKEL (118) p. 113.

Lichenocystis, nom. nov. pro *Lichenoides* "da dieser Name bereits verbraucht war" [where? when? by whom?], and *L. prisca* (olim *Lichenoides*) Barr. redescribed; HAECKEL (118) p. 148, pl. iv.

Lichenoides priscus; JAHN (145) pp. 685, 691, 697, 719, 740, 752: redescribed, referred to *Caryocrinidæ*; POMPECKJ (268) p. 502, pl. xiii.

Lysocystis; BATHER (31).

Macrocystella; HAECKEL (117) p. 402.—*M. mariæ*, referred to *Mimocystis* or *Homocystis*?; HAECKEL (118) p. 149.—*M. bavarica* (olim *Cystidea*) Barr.; POMPECKJ (269) p. 90.

Malocystis; HAECKEL (117) p. 401: redefined, and *M. murchisoni* redescribed; HAECKEL (118) p. 105.

Megacystis, vide sub *Holocystis*.

Megaplacta (= *Parcystidea*), ord. nov.; HAECKEL (118) p. 77.

Mesites; HAECKEL (117) p. 401: redefined; HAECKEL (118) p. 118.—*M. pusireffskii*, redescribed; HAECKEL (118) p. 119.

Microplacta (= *Eucystidea*), ord. nov.; HAECKEL (118) p. 77.

Mimocystis; HAECKEL (117) p. 402: redefined, incl. *Macrocystella* Callaway [which is 10 years older]; HAECKEL (118) p. 149: considered syn. of *Macrocystella*; POMPECKJ (269) p. 90.—*M. bohemica*, redescribed; HAECKEL (118) p. 149, pl. iv.

Mitrocystis; HAECKEL (117) p. 398: redefined, and *M. mitra* redescribed; HAECKEL (118) p. 43, pl. ii.

M., (?) n. sp., *Paradoxides* beds on the Studená hora, N. of Tejřovic, Bohemia, also at Pod trním; POMPECKJ (268) p. 504, pl. xiv: this is the fossil described by Jahn (48) Zool. Rec. 1894 as "Eine andere neue Cystideengattung"; JAHN (145) pp. 660, 691.

Orocystida, subfam. nov. of *Aristocystida*; HAECKEL (118) p. 49.

Orocystis; HAECKEL (117) p. 397: redefined; HAECKEL (118) p. 56.—*O. helmhackeri*, redescribed; HAECKEL (118) p. 57.

Palæocystida or *Echinosphærida*, s. str.; HAECKEL (117) p. 397: (= *Archæocystida*), defined (p. 12), defined, skeleton described (p. 61), classified (p. 64); HAECKEL (118).

Palæocystis; HAECKEL (117) p. 397: redefined; HAECKEL (118) p. 69.

P. pentolena, Ordovician, Canada; HAECKEL (118) p. 69, pl. i: n. sp.

Palamphora, nom. nov., hypothetical ancestral genus; HAECKEL (117) p. 396, and (118) p. 33.

Palmacystis, n. g., with genotype *Palmacystis palmata*, based on "Hydrophores palmées," Ordovician, Bohemia; HAECKEL (118) p. 151, pl. iv: n. sp.

Pentactæa, hypothetical ancestral genus; HAECKEL (117) p. 396, and (118) p. 32.

Phacocystis Haeckel, quoted as syn. of *Pseudocrinus*, from HAECKEL (117) [but the name does not occur in *loc. cit.*]; HAECKEL (118) p. 135.

Pirocystida, sub-fam. nov. of *Aristocystida*; HAECKEL (118) p. 49.

Pirocystis, nom. bene emend. pro *Pyrocystites* Barr., redefined, and *P. pirum* redescribed; HAECKEL (118) p. 53, pl. ii.

Placocystida, sub-fam. nov. of *Anomocystida*; HAECKEL (118) p. 37.

Placocystis, redefined (incl. *Anomalocystis* Woodw.), and *P. crustacea*, nom. mut. pro *Anomalocystis* vel *Anoplura* [Enoploura] vel *Ateleocystis balanoides* Meek, redescribed, with restored fig.; HAECKEL (118) p. 39.—*P. forbesianus*, redescribed, under name *Atelocystis gegenbauri*, n. sp.; HAECKEL (118) p. 42: H. Woodward's old figure modified and with a new legend; BATHER (28) p. 102.

Pleurocystida, combined with *Anomalocystida*, as sub-fam.; HAECKEL (118) pp. 33, 37.

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Pleurocystis; HAECKEL (117) p. 398: redefined, and *P. filitexta*, redescribed; HAECKEL (118) p. 44, pl. ii.

Pomocystida (= *Sphæronitida* pars); HAECKEL (117) p. 401: fam. nov. including sub-famm. *Sphæronitida* and *Proteocystida*; HAECKEL (118) pp. 77, 94.

Pomocystis, n. g., with genotype *P. uva* (olim *Sphæronis*) Ang. and including *P. sulcifera* and *P. minuta* Ang. sp.; HAECKEL (117) p. 401, and (118) p. 99.

Pomonites, n. g., with genotype *P. pentactæa*, Ordovician of Scandinavia; HAECKEL (118) p. 96: n. sp.

Pomosphæra, n. g., with genotype *P. oblonga* (olim *Sphæronis*) Ang.; HAECKEL (118) p. 99.

Protamphora, nom. nov., hypothetical ancestor of hypothetical *Palamphora*; HAECKEL (117) p. 396, and (118) p. 33.

Proteocystis; HAECKEL (117) p. 401: redefined, and *P. flava* redescribed; HAECKEL (118) p. 100.

P. barrandena, based on Barrande, pl. xxx, figg. 23–26, Lower Devon., Bohemia; HAECKEL (118) p. 101: n. sp.

Protocrinus; HAECKEL (117) p. 401: redefined, and *P. fragum* (incl. *P. oviformis* Volb. pars), and *P. oviformis* Eichw. redescribed; HAECKEL (118) p. 104.

Pseudocrinida, sub-fam. nov. of *Callocystida*; HAECKEL (118) p. 129.

Pseudocrinus; HAECKEL (117) p. 401.—*P. bifasciatus*, redescribed; HAECKEL (118) p. 135, pl. iii.—*P. oblongus*, referred to *Staurocystis*, and *P. quadrifasciatus* made type of *Staurocystis*; HAECKEL (118) p. 134.

Psolocystis, nom. nov., genus hypotheticum, with genotype *P. decanema*, species hypothetica, belonging to *Ascocystida*; HAECKEL (118) p. 124.

Pyrocystis; HAECKEL (117) pp. 397, 402 [vide *Pirocystis*].

Rhombifera, called *Rhomboporita* and then criticised; HAECKEL (118) p. 19.

Scolocystis, nom. nov. pro *Echinocystis* Hall non Thomson; GREGORY (109) p. 133: but was preocc. by *Lysocystis* S. A. Miller; BATHER (31).

Sphærocystis; HAECKEL (117) p. 401: redefined, and *S. multifasciata*, redescribed; HAECKEL (118) p. 133, pl. iii.

Sphæronites; HAECKEL (117) p. 401: redefined and restricted, includes *S. pomum*, *S. globulus*, *S. ovalis*; *S. pomum*, redescribed; HAECKEL (118) p. 98.—*S. pyriformis*, Keisley Limestone; REED (276) p. 82.

Sphæronitidæ, defined, includes *Sphæronis*, *Glyptosphæra*, *Protocr.*, *Fungocystis*, *Proteocystis*, *Holocystis*, *Eucystis*, *Gomphocystis*; ZITTEL (356) p. 153, and ZITTEL-EASTMAN (357) p. 182.

Staurocystis, n. g., with genotype *S. quadrifasciata* (olim *Pseudocrinus*); HAECKEL (118) p. 134, pl. iii.—*S. oblonga* (olim *Pseudocr.*); *loc. cit.*

Staurosoma rarum Barr., doubtfully referred to *Staurocystis*; HAECKEL (118) p. 134.

Stephanocystis, hypothetical genus (also called *Stephanamphora*); HAECKEL (117) p. 396.

Stromatocystis, n. g. (p. 505), with genotype *S. pentangularis*, n. sp. (p. 506), Cambrian of Pod trním near Tejřovic, Bohemia, perhaps incl. *Cystidea concomitans*, Barr.; POMPECKJ (268) Jahrb. geol. Reichsanst. xlv, pl. xiii.—*S. pentangularis* is the fossil described by Jahn (48) Zool. Rec. 1894 as "Eine neue...Cystideengattung (mit dem *Agelacrinus* noch am nächsten verwandt) in zwei Formen"; JAHN (145) pp. 660, 691, 752.

Sycocystida, subfam. nov. of *Glyptocystida*; HAECKEL (118) p. 141.

Sycocystis (= *Echinoencrinus*); HAECKEL (117) p. 402: redefined, incl. *Echinoencrinus* pars, and *Gonocrinus* Eichw.; HAECKEL (118) p. 145.—*S. angulosa*, incl. *Echinoencrinus senckenbergi* et *E. striatus*, redescribed; *loc. cit.*

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Thuriocystis, nom. nov.; HAECKEL (117) p. 402: genus hypotheticum, with genotype *T. pentadecalis*, species hypothetica, belonging to *Ascocystida*; HAECKEL (118) p. 124.

Tiarocrinus quadrifrons, doubtfully referred to *Staurocystis*; HAECKEL (118) p. 134.

Trigonocystis, n. g., with type *T. trigona*, incl. *Trochocystis bohemica*, Barr. var. pl. iii, figg. 29–38, Cambrian, Bohemia; HAECKEL (118) p. 38, pl. ii: n. sp.

Trinemacystida, subfam. nov. of *Palæocystida*, for *Arachnocystis* and *Trinemacystis*; HAECKEL (118) p. 64.

Trinemacystis, n. g., with type *T. triactis* (3-rayed var. of *Echinosphæra aurantium*), perhaps incl. *E. gyllenhali* Quenst., Ordovician, Scandinavia; HAECKEL (118) p. 65 : n. sp.

Trochocystis; HAECKEL (117) p. 398: redefined; HAECKEL (118) p. 38.—*T. bohemicus* of Jahn (48) Zool. Rec. 1894, p. 271, is *Stromatocystis*; JAHN (145) p. 660, see also pp. 697, 701, 719, 731, 732, 740, 743, 745, 742: various plates; POMPECKJ (268) p. 503, pl. xiii: redescribed; HAECKEL (118) p. 38.

(H.)—†BLASTOIDEA.

Defined (p. 452), classified (p. 460): Order I. *Eublastoida* or *Pentremitaria* (*Codonasterida*, *Orophocrinida*, *Elæacrinida*, *Pentremitida*). Order II. *Parblastoida* or *Astrocrinaria* (*Eleutherocrinida*, *Astrocrinida*); HAECKEL (116).

General account; KOKEN (171) p. 286.—General account, classification follows Etheridge & Carpenter; ZITTEL (356) p. 158: with additional notes by Wachsmuth; ZITTEL-EASTMAN (357) p. 188.

Blastoidea, derived from *Cystoblastus*; JAEKEL (141): relations to Cystidea, *Blastoidocrinus*, *Asteroblastus*, and *Astrocystis* (Whiteaves non Haeck.); WHITEAVES (345) p. 291.

Codaster jessieæ, Chouteau limestone, Sedalia, Mo.; MILLER & GURLEY (234) Bull. Illinois Mus. x, p. 89, pl. v, n. sp.

Orophocrinus fusiformis, restored figure; BATHER (28) p. 101.

Pentremitidea, diagrammatic restoration (p. 835, fig. 11).—*P.* sp. *?eifelensis*, described, section across theca (p. 831), *P.* cf. *gilbertsoni*, described, section of hydrospires (p. 829, pl. xxvi); OEHLERT (250).

(K.)—†INCERTÆ SEDIS.

"Spheroidal bulb, of nodose, sculptured plates"; MILLER & GURLEY (235) Bull. Illinois Mus. xii, p. 46, pl. ii.

Spatangopsis, see under IV, C.

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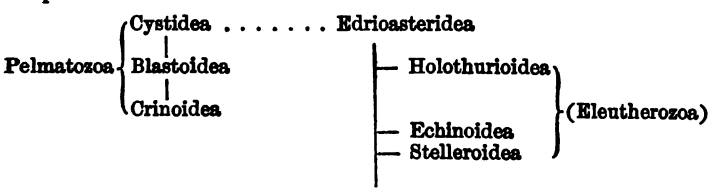
A Phylogenetic Classification of the Pelmatozoa.

By F. A. Bather, *M.A., F.G.S.*

The classification is an epitome of that adopted in a forthcoming text-book of Zoology edited by Professor Ray Lankester. The standpoint is phylogenetic, and is based on the following beliefs.

The Pelmatozoa represent a grade of structure passed through by the ancestors of all echinoderms in their passage from the bilaterally symmetrical Dipleurula stage to the radiate stage. The essential feature was fixation by the primitive oral (anterior) end, followed by the upward passage of the mouth. The foregut in that passage involved other organs of the primitive left side, especially the left anterior cœlom and its offshoot the left hydrocœl. The primitive pelmatozoon had not acquired radiate symmetry. This was induced by the extension from the central upwardly directed mouth of ciliated food-grooves (subvective system of Hæckel). The presence of anus and hydropore on the oral surface forbade absolute symmetry of extension; hence the primitive number of grooves was three—one anterior away from the anus, one right, and one left. Bifurcation of the right and left grooves produced the number five, as now we see it. It was after the pelmatozoan type of structure had been attained that some forms again relinquished the attached mode of life, and assumed a position with the mouth anterior, as Holothurians, or with it downwards, as Stelleroidea and Echinoidea. In the torsion of their internal organs, in the pentamerous symmetry, and in other details, all these forms bear the mark of their pelmatozoan ancestry. This need not mean that they were descended from any pelmatozoan genera with which we are acquainted, although the Edrioasteridea certainly do present features in the structure of the subvective grooves which enable them to be compared with the primitive Echinoidea and Asteroidea. These features cause the separation of the Edrioasteridea as a distinct Class, a step already taken by Billings, Huxley, Chapman, Worthen, Steinmann, Jækel, and others. The Holothurians, Stelleroids, and Echinoids may be grouped together as Eleutherozoa, without implying any genetic connection between them further than that due to their independent descent, at different periods, from pelmatozoan ancestors. Between the latter, however, the connection is so evident that it should be recognised by the retention of them in a sub-phylum Pelmatozoa.

The mutual relations of the Classes are thus conceived, the older being placed at the top:—



The starting-point of the Cystidea is a simple, many-plated sac-like form, the skeleton of which presents no trace of radial subvective or ambulacral systems; the porous structure of the stereom is indefinite, and no stem is differentiated. Hæckel's Order Amphoridea is adapted to include this and such modifications of it as did not attain radiate symmetry. Further modifications of this type depend on the mode of extension of the subvective system. In one group these extensions pass over the thecal plates (epithecal), while still further extensions arise from the grooves on 'exothecal' processes (brachioles). In the other group exothecal brachioles spring at once close to the mouth. These two types are in the main correlated with two gradual differentiations of stereom structure. In the former the simple or irregular haplopores become connected in pairs (diplopores). In the

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latter the pore-canals come to lie parallel to the surface of the test and at right angles to the sutures between the plates (pore-rhombs). These canals really represent stroma-strands, and sometimes, perhaps, hæmal lacunæ; there were no true pores. Enlargement of the thecal plates emphasised this rhomb-structure, since it added strength to the plates. Diminution in size of the thecal cavity and pressure of the coiled gut against its walls concentrated these structures in definite areas, while the need for compensating this restriction of the assumed respiratory area led to the specialisation of the remaining pore-rhombs as 'pectini-rhombs.' These facts justify the Orders Diploporita and Rhombifera, and leave only a few Cystidea in the provisional Order Aporita. In none of these forms has the radial symmetry of subvective and ambulacral systems induced completely correlated symmetry in the theca. The Diploporita, however, tend gradually and clearly in this direction, and lead imperceptibly to the Blastoidea. Either the Blastoidea, as hitherto understood, must be placed with Cystidea; or their limits must be enlarged to include such Diploporita as have this definite correlation and plates that can be called 'radials.' The latter course enables us to define the Cystidea with greater precision, and is therefore adopted.

The Blastoidea, therefore, have to be divided into two grades—Protoblastoidea and Eublastoidea. The classification of the latter into Regulares and Irregulares is no statement of genetic affinity. Moreover, Etheridge and Carpenter's families of the Regulares are based almost entirely on the relations of the hydrospire-canals to the deltoids, relations which may vary considerably even in an individual. Renewed study of the relations of the hydrospires to the ambulacra, of persistent peculiarities of ornament, and the affinities of individual genera, suggests that there were three lines of development arising from *Codaster*, *Troostocrinus*, and *Nucleocrinus* respectively. Stages in the evolution of these lines determine the establishment of families.

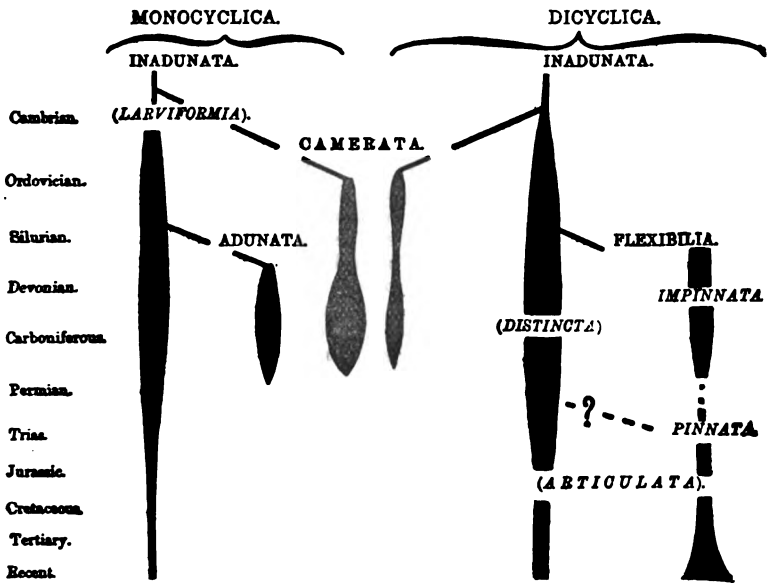
From forms that had acquired pentamerism of the theca, and that, apparently, possessed hydrospires, the Crinoidea were differentiated by the evolution of true brachia. These in their origin are not exothecal, but actually thecal, and bear along with them epithecal branches of the subvective system, but not brachioles. Such a form is *Hybocystis*. The many-branched and pinnulate arms, the simple and definite calycal system, or the compound and indefinite cup, the plateless or the vaulted tegmen, can all be traced back to such a simple ancestor through actual known genera. The sole gap that cannot be bridged within the limits of the Crinoid class is that between the monocyclic and dicyclic base. The history of these two divisions is shown in the annexed diagram, from which, if it be a true presentment, it appears that the Orders previously accepted are polyphyletic, and are statements of convergent structure, not of affinity. It is, however, well to accept existing terms so far as possible.

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Dividing all Crinoidea into *Monocyclica* and *Dicyclica*, we trace in each Order a gradual and, to some extent, parallel modification, here and there diverging in somewhat similar directions. Thus the simplest forms in each Order are *Inadunata*, with free distinct arms, and pass from a Larviform stage, with simple tegmen, to a Fistulate stage, with more complex anal tube and tegmen. At an early period (? Cambrian) in the history of the Monocyclica, the Camerate modification—viz., rigid incorporation of brachials in cup and ambulacrals in tegmen—affected a few forms, and thus arose *Monocyclica Camerata*. At a later period (Silurian) was a repetition of this modification, but one affecting the cup to a far less extent, and resulting chiefly in a solid tegmen and biserial arms; thus arose the *Monocyclica Adunata* (or Platycrinoidea), which even Wachsmuth and Springer find a difficulty in placing with the Camerata. These two highly specialised branches died out before the close of the Palæozoic epoch, the Adunata outliving the Camerata; but the simpler Inadunate forms continued, and reached a high degree of specialisation in their Jurassic descendants, to which the living *Hyocrinus* is closely related. The Dicyclica Inadunata similarly gave off the *Dicyclica Camerata*, which persisted only a little less long than their monocyclic convergents. The dicyclic Crotalocrinidæ of the Silurian are curiously parallel to the Monocyclica Adunata, but it is not worth while to separate them from the

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typical Inadunata. About the same time arose among the dicyclic Inadunata the modification that resulted in the *Flexibilia*, with brachials loosely incorporated in dorsal cup. The dicyclic Inadunata came to their acme in Carboniferous times: their arms were then 'distinct,' and only those forms persisted to Neozoic and Recent periods which assumed an Articulate modification—viz., a loose lateral union of proximal brachials, as seen in Pentacrinidæ, which are convergents of the Neozoic Flexibilia. The latter Sub-Order was represented during Palæozoic times by the Ichthyocrinoidea (Impinnata). Between them and the Neozoic Apiocrinidæ, Bourgueticrinidæ, &c. (Pinnata) the links are missing, but may yet be found among Permian and Triassic crinoids (*vide supra*). At any rate, the Neozoic Flexibilia, when they assumed the free-swimming habit, took a new lease of life, and have their acme in our own day.



Supposed Relations of the Orders and Sub-Orders of Crinoidea.

On the foregoing principles and beliefs, along with many others related in the book itself, is based the following classification of Pelmatozoa:—

SUB-PHYLUM PELMATOZOA.—Theca calcified and plated; oral surface uppermost, usually attached temporarily or permanently by aboral surface. Food brought to mouth by ciliated grooves, which may be endothecal (*i.e.*, between the plates), epithecal, exothecal, or, in part and secondarily, hypothecal. Anus usually in upper half of theca, never aboral. An aboral nerve-centre coordinates the movements of the whole skeleton. Hydrocircus communicates indirectly with exterior; podia, when present, respiratory, not locomotor.

Class I. CYSTIDEA.—Radial polymeric symmetry of theca developed either not at all, or not in complete correlation with radial symmetry of ambulacral and subvective systems. The latter is exothecal or epithecal, not endothecal.

Order 1. AMPHORIDEA.—Radial symmetry has affected neither food-grooves nor thecal plates, nor, probably, nerves, ambulacral vessels, nor gonads.

Fam. *Aristocystidæ*. No extension of food-grooves on theca or skeletal processes; thecal plates irregular, unspecialised; no stem. *Dendrocystidæ*. Single oral skeletal process; thecal plates irregular, merging gradually into stem. *Anomalo-*

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cystidæ. Theca compressed in plane of thecal apertures; the plates of the two sides inclosed by a common frame of marginals; food-grooves conveyed on spines, one at each upper angle of theca; no pores.

Order 2. RHOMBIFERA.—Radial symmetry affects food-grooves, and (in more advanced families) thecal plates; probably also nerves and ambulacral vessels, but not gonads. Food-grooves exothecal, the brachioles being either close to mouth, or removed from it on a series of subambulacrals not derived immediately from thecal plates, or separated from it by hypothecal passages. Stereom and stroma become arranged in folds and strands at right angles to sutures.

Fam. *Echinosphæridæ*. Thecal plates numerous, indefinite, with pore-rhombs. Brachioles circumoral, unbranched. Columnals not uniserial. *Comarocystidæ*. Thecal plates numerous, indefinite, with strong radial structure of stereom, but no pore-rhombs. Brachioles branched; columnals uniserial. *Macrocystellidæ*. Thecal plates in three or four circlets, subject to somewhat regular pentamerism, with radiately folded stereom, but no pores. Brachioles borne by upper circlet. *Tiaracrinidæ*. Plates forming sides of theca are in not more than two circlets; with strong transverse pore-rhombs in each circlet. *Malocystidæ*. Thecal plates numerous, indefinite, radiately folded, no rhombs. Food-grooves on exothecal processes pass over theca and bear brachioles. *Glyptocystidæ*. Theca of five circlets of alternating plates, typically five in each circlet; but in aboral circlet r. post. and r. ant. plates are always fused. Anus between second and third circlets in r. post. interradius. Hydropore in adoral circlet, opposite unpaired food-groove, defines post. IR. Pectini-rhombs present, one always uniting l. post plate of first aboral row with l. ant. plate of second row. Food-grooves, bordered by plates derived from proliferation of adoral circlet, pass over theca and bear biserial brachioles. (Sub-famm. *Echinoencrininæ*, *Callocystinæ*, *Glyptocystinæ*.) *Caryocrinidæ*. Thecal plates primitively in four circlets, dominated by trimerous symmetry, and united by pore-rhombs. Food-grooves in adoral region are hypothecal, then for a short space epithecal, and distally exothecal and brachioliferous.

Order 3. APORITA.—Pentamerism affects food-grooves and thecal plates, probably also nerves and ambulacral vessels, but not gonads. Food-grooves exothecal and circumoral. No folds, pores, or rhombs.

Fam. *Cryptocrinidæ*. Thecal plates in four circlets.

Order 4. DIPLOPORITA.—Radial symmetry affects food-grooves, and by degrees the thecal plates connected therewith, but not interradial plates; probably also nerves and ambulacral vessels, but not gonads. Food-grooves epithecal (without intermediary of subambulacrals), also prolonged on exothecal brachioles, which line the epithecal grooves. Stereom may be folded, but pore-rhombs not developed; diplopores always present in mesostereom, but restricted in distribution in higher forms.

Fam. *Sphæronidæ*. Food-grooves do not extend beyond adoral circlet. Diplopores diffuse. *Glyptosphæridæ*. Food-grooves extend beyond adoral circlet, and irregularly transgress sutures between thecal plates. Diplopores diffuse. *Protocrinidæ*. Food-grooves extend almost to aboral pole, and are regularly bordered by alternating thecal plates (adambulacrals) which bear brachioles. Diplopores diffuse or confined to adambulacrals, from which they are never absent. *Mesocystidæ*. Food-grooves extend almost to aboral pole, bordered by alternating brachioliferous adambulacrals raised above interambulacrals. Diplopores confined to interambulacrals. Five interradial deltoids (Δ) surround peristome. *Gomphocystidæ*. Food-grooves curve around theca; no brachioles.

Class II. BLASTOIDEA.—Five (by atrophy four) epithecal food-grooves, lying on a lancet-plate (? always), pass between five Δ, and are bordered by alternating, brachioliferous adambulacrals. Peristome and all grooves have covering plates. No extensions from gonads and cœlom along rays into brachioles; but, apparently, nerves from aboral centre met in circumoral ring, whence branches passed beneath food-groove and supplied brachioles. Basals (B) and radials (R) always defined; sutures of thecal plates never cross the subvective areas.

Order 1. PROTOBLASTOIDEA.—Thecal plates indefinite in number; no hydrospires. Fam. *Asteroblastidæ* (*Asteroblastus*, *Steganoblastus*, *Blastoidocrinus*). [2]

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Grade Order 2. EUBLASTOIDEA.—Thecal plates definite, in three circlets, viz., 3 BB, 5 RR, 5 Δ. Stereom of RR and Δ, on either side subvective areas, thrown into folds running across radio-deltoid suture (hydrospires).

Series. *Codonoblastida.* Fam. *Codasteridæ* (Eth. and Carp.).—Hydrospire-folds distinctly portions of the thecal plates, coming to the surface of the radial sinus. No distinct hydrospire-canal or pores; spiracles developed imperfectly or not at all. (*Codaster, Phænoschisma, Cryptoschisma, Orophocrinus.*) *Pentremitidæ* (Eth. and Carp. restr.). Hydrospire folds, usually numerous, concentrated at the lowest part of the radial sinus, and partly or wholly pendent. Hydrospire-canal opens through spiracles bounded distally by side-plates. Base convex. Ambulacra rather broad. (*Pentremitidea, Pentremites.*)

Series *Troostoblastida.* Fam. *Troostocrinidæ* (Eth. and Carp.).—Elongate forms with linear ambulacra descending sharply outwards from the much restricted peristome. Hydrospire-folds only slightly concentrated, but communicate with exterior through pores, and through spiracles bounded by Δ and lancet-plates. (*Troostocrinus, Metablastus, Tricœlocrinus.*) *Eleutherocrinidæ.* Elongate, stemless, asymmetrical, with four narrow ambulacra, accompanied by unconcentrated hydrospires. Fifth ambulacrum shortened and widened. Δ minute. (*Eleutherocrinus.*)

Series *Granatoblastida.* Fam. *Nucleocrinidæ.*—Interambulacra show traces of a primitive three plates. Ambulacra linear, and stretching far down the theca, which is ovoid. Hydrospire-folds few and pendent. Spiracles double. Mouth roofed by large plates firmly united into a tegmen. (*Nucleocrinus, Schizoblastus.*) Equals Nucleoblastidæ (E. and C.) *minus Cryptoblastus* and *Acentrotremites. Orbitremitidæ.* Theca globular with concave or flattened base. Ambulacra linear, stretching down to concavity of base. Hydrospire-folds few and pendent; a hydrospire plate always present (unknown in *Heteroblastus*). Hydrospire-folds rarely penetrate Δ, but long canals pass onward, through, beside, or under them, except in *Acentrotremites.* (*Orbitremites, Cryptoblastus, Heteroblastus, Mesoblastus, Acentrotremites*). Corresponds to Granatoblastidæ (E. and C.) *plus Cryptoblastus, Mesoblastus,* and *Acentrotremites. Pentephyllidæ.* Theca subpentagonal, stemless; RR asymmetrical. Ambulacra linear, stretching down to base. One shorter than the rest. (*Pentephyllum.*) *Zygocrinidæ.* Theca depressed, stemless, asymmetrical, quadrilobate. Four ambulacra between the lobes, accompanied by a single hydrospire on either side. Fifth ambulacrum shortened and widened. Δ large. (*Zygocrinus.*)

Class III. CRINOIDEA.—Epithecal extensions of the food-grooves, ambulacrals, superficial oral nervous system, blood-vascular and water-vascular systems, cœlom, and genital system are continued exothecally upon jointed outgrowths of the abactinal thecal plates (brachia), carrying with them extensions of the abactinal nerve system. Brachia, primitively and normally five, always rise from an equal number of thecal plates, 'radials' (RR). Below these is always a circlet, or traces of a circlet, of interradial plates, called 'basals' (BB). A circlet of radially situate 'infrabasals' (IBB) may also be present.

Sub-Class A. MONOCYCLICA.—Base consists of BB only; aboral prolongations of chambered organ interradial; new columnals introduced at extreme proximal end of stem.

Order 1. INADUNATA.—Dorsal cup is confined to the patina and occasional intercalated anals; such Amb or iAmb as enter the tegmen remain supra-tegminal, and not rigidly united.

Famm. *Hybocrinidæ* (incl. *Hybocystis*), *Stephanocrinidæ, Heterocrinidæ* (incl. *Herpetocr.*), *Calceocrinidæ, Pisocrinidæ, Catillocrinidæ, Zophocrinidæ, Haplocrinidæ, Allagecrinidæ, Symbathocrinidæ* (incl. *Phimocr., Stortingocr.*), *Belemnocrinidæ* (incl. *Missouricr.*), *Plicatocrinidæ, Hyocrinidæ, Saccocomidæ.*

Order 2. ADUNATA.—Dorsal cup primitively confined to the patina and an occasional single anal; tegmen solid; portions of the proximal Br and their Amb tend to be rigidly incorporated in the theca. Arms fork once to thrice, and bear pinnules on each or on every other Br. BB fused to three, two, or one. (*Eucladocr.* and Acrocrinidæ offer peculiar exceptions to this diagnosis.)

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Group A. Fam. *Platycrinidæ*, Sub-famm. *Cocoocrininæ* (incl. *Hapalocr.*, *Cordylocr.*), *Cypellocrinæ* (*Cypellocr.* = *Marsupiocr.* Phill. non Blainv.), *Platycrininæ*.

Group B. Fam. *Hexacrinidæ*, *Acrocrinidæ*.

Order 3. CAMERATA.—IBr, two in each ray (exc. *Stereocr.*, *Hadrocr.*, *Alloprocr.*, *Allocr.*) and often succeeding orders of Br are incorporated by iBr in the dorsal cup, while the corresponding Amb are either incorporated in, or pressed below, the tegmen by iAmb; all thecal plates united by suture, somewhat loose in the earliest forms, but speedily becoming close, and producing a rigid theca; mouth and tegminal food-grooves closed; arms pinnulate.

Sub-Order *Melocrinoidea*.—RR in contact all round; IBr_1 quadrangular. Famm. *Glyptocrinidæ*, *Melocrinidæ*, *Patelliocrinidæ* (incl. *Steliodiocr.*, *Macrostylocr.*, *Allocr.*, *Briarocr.*, *Centriocr.* [nom. mut. pro *Centrocr.* W. and Sp. non Austin nec Worthen]), *Clonocrinidæ* (incl. *Clonocr.* Quenst. = *Corymbocr.* Ang., *Trybliocr.*, *Technocr.*), *Eucalyptocrinidæ*, *Dolatocrinidæ*.

Sub-Order *Batocrinoidea*, RR in lateral contact, except in post. IR. Proximal anal heptagonal; IBr_1 quadrangular, exc. in Periechocrinidæ. Famm. *Tanaocrinidæ*, *Xenocrinidæ* (incl. *Compsocr.*, *Abacocr.*), *Carpocrinidæ* (incl. *Acacocr.*, *Desmidocr.*, *Macarocr.*), *Barrandeocrinidæ*, *Cœlocrinidæ* (incl. *Cœlocr.* = *Aorocr.*, W. and Sp., *Dorycr.*, *Agariocr.*), *Batocrinidæ* (incl. *Hyperocr.*, M. and W. [s. *Uperocr.*] = *Lobocr.*, W. and Sp.), *Periechocrinidæ*.

Sub-Order *Actinocrinoidea*. RR in lateral contact except in post. IR; proximal anal hexagonal; IBr_1 usually hexagonal; BB 3, equal, forming a hexagon. Famm. *Actinocrinidæ* (as in Wachsm. and Spr. exc. *Amphoracr.* which forms —) *Amphoracrinidæ*.

Sub-Class DICYCLICA.—Base consists of BB and IBB, the latter being liable to atrophy or fusion with the proximale, but the aboral prolongations of the chambered organ are always radial; new columnals may or may not be introduced at the proximal end of the stem.

Order 1. INADUNATA. Dorsal cup primitively confined to the patina and occasional intercalated anals, no other plates ever occur between RR (Grade—Distincta); Br may be incorporated in the cup, with or without iBr, but never rigidly, and their corresponding Amb remain suprategminal (Grade—Articulata); new columnals introduced at extreme proximal end of the stem.

Sub-Order 1. *Cyathocrinoidea* have a fairly stout tegmen, in which five orals (Δ, sub-ambulacrals, interradials, consolidating apparatus, of authors) are usually conspicuous, helping to stiffen the tegmen, supporting the ambulacra on their adjacent edges, and inclosing but not covering the peristome; post.O frequently a madreporite; radial facet usually narrow, and arms distinct from dorsal cup, unbranched or simply dichotomous; none are known to attain the pinnulate stage, but the presence of pinnules would not in itself remove a genus from the Cyathocrinoidea. Famm. *Carabocrinidæ*/*Palæocrinidæ* (incl. *Porocr.*, *Bactrocr.*), *Euspirocrinidæ*, *Sphærocrinidæ* (incl. *Parisocr.*), *Cyathocrinidæ* (incl. *Gissocr.*, *Lecythocr.*), *Petalocrinidæ*, *Crotalocrinidæ*, *Codiacrinidæ* (incl. *Lecythiocr.*), *Cupressocrinidæ*, *Gasterocomidæ* (incl. *Scolocr.*, *Achradocr.*, *Hypocr.*).

Sub-Order 2. *Dendrocrinoidea* have a thin flexible tegmen, or the ventral surface almost entirely occupied by a large anal tube or ventral sack; orals inconspicuous or entirely atrophied in the adult; no madreporite; radial facet often wide, so that the distinctness of arms from dorsal cup is not maintained; arms dichotomous, the dichotomy often irregular, leading up to a pinnulate stage. Famm. *Dendrocrinidæ* (incl. *Merocr.*, *Ottawacr.*, *Homocr.*, *Thenarocr.*), *Botryocrinidæ* (incl. *Gothocr.*, *Mastigocr.*, *Gastrocr.*, *Rhadinocr.*, *Goniocr.*, *Atelestocr.*, *Streptocr.*), *Lophocrinidæ*, *Scaphiocrinidæ* (incl. *Poteriocr.*, *Woodocr.*, *Zeacr.*, *Coeliocr.*, *Bursacr.*), *Scytalecrinidæ* (incl. *Decadocr.*), *Graphiocrinidæ* (incl. *Æsiocr.*, *Ceriocr.* White), *Cromyocrinidæ* (incl. *Eupachycr.*, *Agassizocr.*, *Tribrachiocr.*, *Phialocr.*, *Ulocr.*), *Encrinidæ* (incl. *Stemmatocr.*, *Erisocr.*), *Pentacrinidæ* (incl. *Dadocr.*, *Holocr.*, and Sub-fam. *Pentacrininæ*), *Uintacrinidæ*, *Marsupitidæ*, *Bathycrinidæ*? (only *Bathycr.*).

Order 2. FLEXIBILIA.—Proximal Br incorporated in dorsal cup, either by

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their own sides, or by iBr, or by a finely plated skin, but never rigidly; plates may occur between RR. Tegmen flexible, with distinct Amb and numerous small iAmb; mouth and food-grooves remain suprategminal and open. Top columnal a persistent proximale, often fusing with IBB, which are frequently atrophied in the adult. Arms non-pinnulate (Grade Impinnata), or pinnulate (Grade Pinnata), but always uniserial.

Grade *Impinnata*.—All plates of the crown united by loose suture or muscular articulation. IBB three, the primitive right posterior remaining as the small unfused IB. Br united by waving sutures, often with patelloid plates. Arms isotomous, or rami may bear ramules on one or both sides, but no pinnules. Ventral groove wide and shallow; axial canal separated from it in proximal region. Five O, between which food-grooves pass to the mouth.

Famm. *Ichthyocrinidæ* (incl. *Pycnosaccus*, *Lecanocr.*, *Cyrtidocr.*, *Clidochirus*, *Mespilocr.*), *Idiocrinidæ*, *Taxocrinidæ* (incl. *Gnorimocr.* [genotype *Taxocr. expansus*, Ang.], *Anisocr. Homalocr.*), *Dactylocrinidæ* (incl. *Calpiocr.*, *Lithocr.* [genotype *Forbesiocr. divaricatus*, Ang.], *Synerocr.*, *Euryocr.*, *Onychocr.*), *Sagenocrinidæ* (incl. '*Forbesiocr.*' *Agassizi*). Impinnata incertæ sedis: *Edriocr.*, *Cleiocr.*, *Rhopalocr.*

Grade *Pinnata*.—BB and RR united by close suture, RR and proximal Br by muscular articulation or syzygy; pseudomonocyclic; arms pinnulate and either simple or isotomous; axial canal separate from ventral groove throughout; Iax is generally IBr_2, rarely IBr_1; five O present in early stages and sometimes in adult, but usually atrophy; anals do not form part of the dorsal cup in the adult.

Famm. *Apiocrinidæ* (incl. *Calamocr.*), *Bourgueticrinidæ* (incl. *Mesocr. Rhizocr.*), *Antedonidæ* (incl. *Thiollierocr.*, *Eudiocr.*, *Promachocr.*), *Atelecrinidæ*, *Actinometridæ*, *Thaumatocrinidæ*, *Eugeniacrinidæ*, *Holopodidæ*, *Eudesicrinidæ*.

Order 3. CAMERATA.—All IBr and usually IIBr incorporated in the dorsal cup by iBr, at first loosely, but afterwards by close suture. IBB always the primitive 5. Arms pinnulate. A plate always between right and left posterior RR, resting on posterior B, and followed by others leading up to the anus. Mouth and ambulacra subtegminal.

Famm. *Reteocrinidæ* (only *Reteocr.*), *Dimerocrinidæ* (incl. *Ptychocr.*, *Orthocr.*, *Hyptiocr.*), *Lampterocrinidæ* (incl. *Siphonocr.*), *Rhodocrinidæ*.

Class IV. EDRIOASTERIDEA.—Theca composed of an indefinite number of irregular plates, some of which are variously differentiated in different genera; no skeletal appendages; central mouth, from which there radiate through the theca five unbranched ambulacra, composed of a double series of alternating plates, sometimes supported by an outer series of larger alternating plates. Pores between (not through) the ambulacral elements, or between them and the thecal plates, permitted the passage of extensions from the perradial water-vessels. Anus in posterior interradius, on oral surface, closed by valvular pyramid. Hydropore (?) between mouth and anus.

Fam. *Agelacrinidæ*. Theca composed mostly of thin plates, flexible, attached temporarily or permanently by the greater part of the aboral surface; ambulacra confined to oral surface. (*Stromatocystis*, *Cystaster*, *Hemicystis*, *Agelacr.*, *Streptaster*, *Lepidodiscus*, *Haplocystis*, *Discocystis*. (Perhaps incl. *Cyclocystoides*). *Cystidocystidæ*. Theca composed on oral surface of five deltoids surrounded by marginals, but below of a fused solid mass of stereom, which forms a permanent incrusting root. *Edrioasteridæ*. Flexible theca of thin plates; loosely attached by excavate aboral surface; ambulacra pass on to aboral surface. (*Edrioaster*, *Dinocystis*).

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A Record of, and Index to, the Literature of ECHINODERMA published during the year 1898, with a few items from previous years.

Compiled by F. A. BATHER.

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BRITISH MUSEUM (NAT. HIST.),
CROMWELL ROAD,
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DEAR SIR,

In forwarding the Zoological Record—section Echinoderma, for the year 1899, I beg to thank you heartily for the help you have given me by sending a copy of your paper 2.

I trust that you will continue to favour me with copies of anything you may write in any way bearing on Echinoderms; and I venture to point out that such gifts are doubly welcome when they bear the original pagination, the numbers of the plates and of the volume, and the correct month of publication.

Yours very gratefully,

J. A. Bather

Prof. A. Agassiz

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XIV. ECHINODERMA.

BY

F. A. BATHER.

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INTRODUCTION.

I. Titles. Last year's Introduction admitted that the Record for 1896 and 1897 was incomplete. The publications come to hand since that Record went to press permit us to raise the number of titles for 1896 to 188, for 1897 to 176. No falling off is seen in the list for 1898, which already includes 167, and will no doubt eventually be found to equal or exceed the lists of preceding years. The total number of titles in the present Record, viz., 231, is thus made up: 1885, 1; 1887, 1; 1888, 1; 1891, 1; 1892, 2; 1893, 3; 1894, 3; 1895, 3; 1896, 20; 1897, 29; 1898, 167. The papers from the earlier years include some that have been very difficult of access, and this seems all the more reason why they should be recorded when at last obtainable. In addition to the titles now first recorded, further information is given concerning 57 papers or books previously noted.

Every attempt has been made to determine the true date of all publications alluded to. Thanks to the spread of education among editors, this is gradually becoming more easy. Still, however, there are people who seem to delight in a misleading date; and the annoyance caused by imperfect bibliographic information still detracts from one's pleasure at receiving an Author's reprint. For examples to be avoided, see under Coulon, Gregory, Whiteaves.

Catch-numbers to the divisions of the Subject-Index are, as before, inserted in square brackets at the end of each title. Those referring to the Systematic portion [IV, A—K] are inserted only when some question of definite importance to the systematist is dealt with in the work.

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The bulk of the Subject-Index is far less in proportion to the number of titles than was the case in the last volume. This is due in part to various alterations (improvements, it is hoped) in the arrangement of both matter and type. But it is more largely due to the absence of any great works, such as those by LUDWIG (210) and WACHSMUTH & SPRINGER (336) in last year's Record.

II. BIOLOGY. A. There are no general writings of special importance to the student of Echinoderms.

B. Anatomical research on the Holothurians is continued with valuable and suggestive results by ÖSTERGREN (165); while other matter of importance is found in CLARK's paper on *Synapta vivipara* (32), DENDY's on *Caudina* (45) and LUDWIG (135 & 137). In Echinoidea, KOEHLER (117) contributes new details on the anatomy of recent *Echinothuridæ*; ST. HILAIRE's exhaustive account of the wandering cells (191) is unfortunately liable to be overlooked. Under Asteroidea, DOEDERLEIN'S account of specimens collected by SEMON (50) is of singular interest to the student of skeletal structures; the "Krystallkörper" which he describes remind one of the "Glasplättchen" found by LUDWIG in *Ophiomyxa* and described in a paper (141) which also contains valuable notes on *Gorgonocephalus*. BATHER's review of Wachsmuth and Springer (15) deals at length with the comparative anatomy of the Crinoid skeleton. More special studies are by SPANDEL (201) on *Cyathocrinus* and BATHER (16) on *Petalocrinus*. The latter author (16A) introduces a new type of *Edrioasteroid* structure.

LAHILLE (126) again appears as a conscientious student of variation in an Echinoid. Interesting cases of meristic variation in Echinoids are discussed by CHADWICK (31) and OSBORN (164); in Ophiuroids by DOEDERLEIN (49); in *Holothuria* by LUDWIG (138); and in *Petalocrinus* by BATHER (16).

Several new cases of protection of the young in Holothurians are discussed by LUDWIG (136, 137).

C. The physiological observation of chief importance is the discovery by BORDAS (21) of urates in the respiratory trees of Holothurians. UEXKÜLL (208, 209) continues his experiments on Echinoids, dealing this time with sensation.

D. Numerous observations on Bionomics are referred to in the Subject-Index, but special attention may be directed to the thorough paper by PRUVOT (180) on the distribution and habitats of the Invertebrates in the Golfe du Lion and off the north coast of Brittany; and to VERNON'S studies (212, 213) of the effects of environment on the growth of Echinoid larvæ. The important subject of Regeneration has been studied experimentally by KING (114), while noteworthy observations on autotomy in Ophiurids are communicated by DOEDERLEIN (49) and SLUITER (199). To this section has been added a paragraph (x) on Echinoderms as Rock-formers, a study in which biologists are becoming as much interested as geologists: here comes the excellent work of CAYEUX (30) on the Chalk.

F. One of the most valuable papers of the year is that by MORTENSEN (156, 157) who attempts to apply the methods of the systematist to the larval forms of Echinoderms; the establishment of several new species upon plutei of which the adults are unknown may cause trouble; but as to the utility and thoroughness of MORTENSEN'S descriptions there can be no doubt. An important embryological paper is that by H. L. CLARK (32) on *Synapta*. GOTO (81, 82) and MACBRIDE (142) will some day, it is to be hoped, give us a clear and consistent account of Asteroid development; at present there are discrepancies due to either different material, imperfect methods of research, or the personality of the observers.

The change of Holothurian spicules during growth, to which attention was directed in 1897 by MITSUKURI is the subject of highly interesting papers from LUDWIG (136, 137) and ÖSTERGREN (166). The importance to

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the student of evolution and to the systematist of the study of post-larval growth changes is shown by DOEDERLEIN'S remarkable memoir on *Goniodiscus sebæ* (50).

The eggs of the sea-urchin continue to serve as *corpora vilia* for the experimental embryologist, and DELAGE (43) in particular has obtained a result of the most profound significance. The experiments of VERNON (214) and DRIESCH (54) are also of great interest to the student of sex and heredity. The mere echinologist will be more interested in HERBST'S investigation into the chemical composition of the water most favourable to the development of Echinoderms (96, 97, 98).

III. A. Among faunal studies, one of topical interest is LUDWIG'S account of the Holothurians collected by the Hamburg expedition to Magellan Str. (137), discrediting the bipolar hypothesis, which however is supported by PRATT (178). LUDWIG'S papers on the Holothurians and Ophiuroids of the Plate collection (138, 141) are of much significance, and should be compared with the New Zealand studies of FARQUHAR (61) and DENDY (46). LÖNNBERG'S account of the fauna of Öresund (134) has more than local interest. PRUVOT (180) has been alluded to above. Other studies of Mediterranean Echinoderms are by PALLARY (168), LUDWIG (135), GOURRET (85) and KOEHLER (120). The last mentioned author also deals with Echinoderms dredged by 'l'Hirondelle' in various parts of the N. Atlantic (117), and by H.M.S. 'Investigator' in the Indian Ocean (118, 119). Here too see ANDERSON (7) and DOEDERLEIN (48, 49). In the Pacific area, besides the writings of LUDWIG above referred to, the chief work is by AGASSIZ (2) on the Echinoids collected by the 'Albatross.' YOSHIWARA (228) continues the study of Japanese Echinoids.

III. B. Under Geological Distribution and the study of extinct faunas, must be mentioned the work on the fossil Echinoids of Cuba by EGOZCUE Y CÍA (55). In Egypt the Tertiary rocks and their Echinoid contents are studied by FOURTAU (65–68) and MAYER-EYMAR (147), while both Cainozoic and Mesozoic Echinoids are described by GREGORY (89). HALL'S correlation of the Tertiary beds of Victoria (93, 94) gives further precision to the horizons of fossil Echinoids from that country. The Jurassic rocks of eastern France are elucidated in the books by A. GIRARDOT (78) and L. A. GIRARDOT (79). In Asia Minor several Jurassic Echinoids from the Caucasus have been described by the lamented SPENDIAROFF (202), and an exceedingly interesting study of the Liassic fauna, especially Crinoids, is contained in the paper of POMPECKJ (176). Turning to America we find suggestive articles by WELLER on Carboniferous (218) and Silurian (220) faunas, with the description of a few Devonian species (219).

IV. The additions to our Systematic lists may be analysed thus:

Holothurioidea.....	9	n. gen.	32	n. spp.	0 n. varr.
Echinoidea 13		„	277	„	11 „
Asteroidea	0	„	18	„	0 „
Ophiuroidea.....	3	„	34	„	3 „
Crinoidea	0	„	23	„	2 „
Cystidea	4	„	0	„	0 „
Blastoidea.....	0	„	0	„	0 „
Incertæ sedis	1	„	1	„	0 „
Total	30		385		16

There are also 2 new sub-genera of Echinoids. Three of the additions to Cystid genera and 4 to Echinoid species are only new names in place of preoccupied names.

The new Holothurians are due chiefly to R. PERRIER (172) and ÖSTERGREN (165), a few to LUDWIG (137); but many of the names are those assigned to larvæ by MORTENSEN (157).

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The exceptionally large number of Echinoid species is misleading, for the vast majority of them should have been entered in the Record for 1887 (see POMEL, 175). Really very little has been done on this group, beyond a preliminary report by AGASSIZ (2), the description of Cuban fossils by EGOZCUE (55), of Echinoids from the N. Atlantic by KOEHLER (117), of Egyptian fossils by MAYER-EYMAR (147, 148) and GREGORY (89), various fossils by OPPENHEIM (163 & 115), Caucasian fossils by SPENDIAROFF (202), and careful studies of Baltic Cretaceous Echinoids by HENNIG (95) and SCHLUETER (194).

The New Zealand Asteroids are studied by FARQUHAR (50). DOEDERLEIN'S important paper has already been alluded to. Nearly all the new names are due to MORTENSEN (157).

The chief papers on Ophiuroids are those of KOEHLER (117, 118, 121), DOEDERLEIN (49) and LUDWIG (141). MORTENSEN (157) again is responsible for many names attached to *Plutei*.

Of the new species of Crinoids, many are founded on fossil centrodorsals of *Antedon* or columnals of some Pentacrinid (NICOLAS 161 and POMEL 175). POMPECKJ (176) has a careful study of some Liassic *Pentacrini*, BATHER (16) assigns many new species to *Petalocrinus*, and WELLER (217, 219) introduces a few N. American forms. BATHER (13) shows that all recent and many fossil species assigned to *Pentacrinus* should really be called *Isocrinus*.

There is no work of importance on *Cystidea* proper, but BATHER (16A) begins a series of studies in *Edrioasteroidea*, a Class which in this Record is, for convenience, retained under Cystids.

In the Systematic Index all species are now placed in alphabetical order under genera, the new ones being distinguished by the addition of **n. g.** or **n. sp.** If only authors would indicate their new species in some such way, and especially would refrain from adding their own names as though the species had already been described by them, then the labours of their colleagues would be greatly facilitated. They might also give up the misleading habit of affixing **n. sp.** to a species already long published. Into one or other of these traps it is hard for a Recorder not to fall.

From this rapid and necessarily invidious Summary, it will be seen that the year 1898, though it has produced nothing very great or very startling in the literature upon Echinoderms, has none the less been fruitful in solid works, and its harvest is undoubtedly abundant.

Any further personal remarks by the Recorder are placed, as heretofore, in square brackets.

CORRIGENDA (in Record of Echinoderma in Vol. XXXIV).

The following additions and corrections should be made in the Record for 1896–97 :—

p. 15. No. 108, after pp. 112–122 insert pl. vii.
No. 109, after pp. 123–136 insert pl. vii.
No. 110, after pp. 1000–1005 insert pl. li.

p. 32. No. 305, the pp. are stated by the *Concilium Bibliographicum* to be 82–89. The paper is still unseen by the Recorder.

p. 53. In III, B, ii, f, Eocene :—insert "Lutetian, road from Ecos to Dampmesnil (Eure), *Macropneustes minor* ; CANU (48)."

p. 115. before *Glyptocrinus carleyi* insert *G. basalis* ;
before *Glyptocrinus gracilis* insert *G. globularis* Nich. and Eth. probably *Archaeocr.*

p. 119. *Melocrinus oblongus* is not n. sp., but was previously published by Wachsmuth and Springer.

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I. TITLES.*

1.*ACKERMANN, K. Thierbastarde. Zusammenstellung der bisherigen Beobachtungen ueber Bastardirung im Thierreich nebst Litteraturnachweisen. I. Theil: Die wirbellosen Thiere; II. Theil: Die Wirbelthiere. 8vo, Kassel (Selbstverlag). [II, F, viii.]
Abstract by B. NÖLDEKE, Zool. Centralbl. vi, p. 113 (7 March, 1899).

2. AGASSIZ, A. Reports on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in steamer "Albatross," &c. xxiii. Preliminary Report on the Echini. Bull. Mus. Harvard, xxxii, No. 5, pp. 71–86, pls. i–xiii, 1 map. (June.) [II, A, i & iv. IV, C.]
Abstracts: in J. R. Micr. Soc. 1898 (Oct.), p. 544; by H. LUDWIG, Zool. Centralbl. v, p. 561 (8 Sept. 1898). Note by J. LAMBERT, Rev. crit. Pal. iii, p. 123 (July, 1899).

ALESSANDRI, G. DE. (1) Zool. Rec. 1897. Critical review by J. LAMBERT, Rev. crit. Pal. iii, pp. 116 & 117 (July, 1899).

3. AMI, H. M. Synopsis of the Geology of Montreal. Brit. Med. Assoc. Guide, pp. 45–49, Author's Edition, Montreal. (Dec. 1897.) [III, B, iv, h.]

4. AMMON, L. v. Das Gipfelgestein des Elbrus nebst Bemerkungen ueber einige andere kaukasische Vorkommnisse. Zeitschr. deutsch. geol. Ges. xlix, pp. 450–481. (Feb.) [III, B, iii, d.]

5. ANASTASIU, V. Le Trias de la Dobrogea. Bull. Soc. geol. France (3) xxv, pp. 890–893. Observations de E. HAUG, p. 894. (Feb.) [III, B, iii, a.]

6. ——. Sur le Crétacé de la Dobrogea. Bull. Soc. geol. France (3) xxvi, pp. 192–194. (May.) [III, B, iii, b.]

7. ANDERSON, A. R. S. Report of the Surgeon Naturalist for the season ending 31st March, 1898. Rep. Marine Surv. India, 1897—1898, pp. 5–12. [III, A, iii.]

8. ANDREWS, E. A. Filose activity in metazoan eggs. Zool. Bull. ii, pp. 1–13. (July.) [II, F, iv.]
Abstract by R. P. B[IGELOW], Amer. Natural. xxxii, p. 878 (Nov.)

9. ANGELIS D'OSSAT, G. DE. Contribuzione allo studio paleontologico dell' alta valle dell' Aniene. Boll. Soc. geol. Ital. xvi, pp. 280–318. (Feb.) [III, B, ii, d; iii, b, *1.* IV, C.]
Abstracts,—Boll. Com. geol. Ital. xxix, p. 286. Critical by P. E. VINASSA DE REGNY, Riv. ital. Pal. iv, pp. 2, 3 (June ?).

ARNAUD, H. (14) Zool. Rec. 1897. Abstract, Annuaire geol. xiii, pp. 296, 297 (April, 1897).—(15) Zool. Rec. 1897. Abstract, Annuaire geol. xiv, p. 323. (April, 1898.)

10. ——. Observations sur le *Cidaris pseudopistillum* Cott. *Brissopneustes Aturensis.* Act. Soc. Bordeaux, liii, pp. 103–118, pl. ii. (July.) [IV, C.]
Review by J. LAMBERT, Rev. crit. Pal. iii, p. 35 (Jan. 1899).

11. BAIN, H. F. Geology of Decatur County. Rep. Geol. Surv. Iowa, viii, 255–309, pls. xxi–xxiv, and folding map. [III, B, iv, d.]

BARTHELS, P. (4) Zool. Rec. 1895. Abstract with reference to methods of research, by E. SCHOEBEL, Zeitschr. wiss. Mikr. xiv, p 473 (4 May).

* An asterisk prefixed to a quotation indicates that the Recorder has not seen the Paper or Work referred to.

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BATHER, F. A. (24) Zool. Rec. 1897. Critical Abstract by O. JAEKEL, N. Jahrb. Min. 1898, i, p. 401 (April).—(27) Zool. Rec. 1897. Abstracts: in Boll. Com. geol. Ital. xxix, p. 146 (Oct.); by O. JAEKEL, N. Jahrb. Min. 1898, ii, p. 545 (Nov.).—(30) Zool. Rec. 1897. Critical Abstract by O. JAEKEL, N. Jahrb. Min. 1899, i, p. 179 (Dec.).—(31) Zool. Rec. 1897. Reply by J. W. GREGORY, Geol. Mag. (n. s.), dec. IV, vol. iv, p. 427 (Sept. 1897).

12. ——. "Mesites." Ann. Mag. Nat. Hist. (7), i, pp. 102, 103. (Jan.) [IV, G.]
Abstract by J. LAMBERT, Rev. crit. Pal. ii, p. 66 (April).

13. ——. *Pentacrinus*: a name and its history. Nat. Sci. xii, pp. 245–256, 1 fig. (April.) Corrigenda, xiii, p. 72 (July). [II, E, iv. IV, F.]
Abstract by J. LAMBERT, Rev. crit. Pal. ii, p. 164 (Oct.).

14. ——. Wachsmuth and Springer's classification of Crinoids. Nat. Sci. xii, pp. 337–345. (May.) [II, B, i, f, *1* & *5*. IV, F.]
Abstract by J. LAMBERT, Rev. crit. Pal. ii, p. 163 (Oct.).

15. ——. Wachsmuth and Springer's Monograph on Crinoids. [First four notices.] Geol. Mag. (n. s.), dec. iv, vol. v, pp. 276–283, 318–329, 419–428, 522–527. (June, July, Sept., Nov.) [II, B, i, f, *1*, *5* & *9*: E, iv.]
A Review of WACHSMUTH, C. & SPRINGER, F. (336) Zool. Rec. 1897, with original matter.

16. ——. *Petalocrinus*, Weller and Davidson. Quart. J. Geol. Soc. liv, pp. 401–441, 15 figg., pls. XXV & XXVI. (5 Aug.) [II, A, i & iii: B, i, f, *5*; ii, d, *2*. III, B, iv, g. IV, F.]
Abstracts: Proc. Geol. Soc. No. 692, pp. 87 & 88 (April). Nature, lviii, pp. 46, 423 (12 May & 1 Sept.). Ann. Nat. Hist. (7), ii, pp. 195 & 196 (Aug.). By J. LAMBERT, Rev. crit. Pal. iii, pp. 37 & 38 (Jan. 1899).

16A. ——. Studies in Edrioasteroidea. I. *Dinocystis Barroisi*, n. g. et sp., Psammites du Condroz. Geol. Mag. (n. s.) dec. iv, vol. v, pp. 543–548, pl. xxi. (Dec.) [II, B, i, g. III, B, iv, f. IV, G.]

17. BEECHER, C. E. The origin and significance of spines: a study in evolution. Amer. J. Sci. (4), vi, pp. 1–20, 125–136, 249–268, 329–359, pl. i. (July–Oct.) [II, A, i: B, i, *a*, *5*; f, *5*.]
Abstract in J. R. Micr. Soc. 1898 (Dec.), p. 619.

18. BELL, A. On the Pliocene Shell-beds at St. Erth. Tr. geol. Soc. Cornwall, xii, pp. 111–166, pls. i–iii. [III, B, ii, c. IV, C.]

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157. ——. Die Echinodermenlarven der Plankton-Expedition nebst einer systematischen Revision der bisher bekannten Echinodermenlarven: in "Ergebnisse der.....Plankton-Expedition der Humboldt-Stiftung," ii, J. 120 pp., ix pls., 1 map. (Jan.)

The text of this is merely a German translation of (156). There are a few additional text-figures. The plate-figures are the same but on more plates. The names of the so-called "new species" must date from (156) which was on sale in November, 1897.

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164. OSBORN, H. L. A case of variation in the number of ambulacral systems of *Arbacia punctulata*. Amer. Natural. xxxii, pp. 259–261, 2 figg. (April.) [II, B, ii, d, *1*.]
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II. BIOLOGY.

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ii. **Relations of Echinoderma**:—Adoral ciliated band of Echinoderm larvæ homologous with endostyle and peripharyngeal band of lower Chordata; GARSTANG (75).—Relation of *Balanoglossus* to Echinoderms; DELAGE (44) pp. 329–331.

iii. **Phylogenies of smaller groups**:—Relation of *Synaptidæ* to other Holothurians; CLARK (32) p. 79.—Aboral poles of *Ast.* and *Crin.* not homologous; GOTO (81) p. 246.—Asymptotic evolution of *Petalocrinidæ* and *Crotalocrinidæ*; BATHER (16) p. 438.

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2. Symmetries:—Vacant.

3. Homologies of Classes:—Vacant.

4. Skeletal tissue:—Vacant, but see under c. *4* and F. vi. c. *4*.

5. Skeletal Anatomy:—Difference between spines in Echinoderma and in other organisms; BEECHER (17) p. 350.

6 & *7.* Hydrocoel, Coelom and other body-cavities:—Cœlom and hydrocœl, general relations and homologies; ZIEGLER (131) pp. 63–65, 71, 73.

8. Digestive System, Cuvierian organs:—Vacant.

9. Nervous Systems:—Nervous tissue; FOL (63) pp. 383, 391.

10. Mesodermal tissues (exc. Skeletal):—Muscle-fibres; FOL (63) pp. 358, 373, 379.

11. Axial organ or Ovoid gland:—Vacant.

12. Genital System:—Vacant.

b. *HOLOTHURIOIDEA*.

1. General anatomy:—Detailed account of gross anatomy of *Synapta vivipara*; CLARK (32) p. 75.

2 & *3.* Vacant.

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4. Skeletal tissue:—Giant spicules found in *Synapta digitata*; Ludwig (135) p. 5.—Differences in spicules of litoral antarctic *Cucumariæ*; Ludwig (137) p. 15.
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6. Hydrocoel &c. Respiratory Trees:—Anal tentacles of *Caudina coriacea* with circumanal ampullæ; Dendy (45).—Different disposition of respiratory trees in *Dendrochirota* connected with differences in coil of gut; Östergren (165) p. 105.—Respiratory trees of *Holothuria* and *Stichopus*; Bordas (21).
7. Coelom and other Body-cavities:—Canal formed in mesentery of *Holothuria poli* near gonads, supposed homologous with aboral sinus of *Ech.*, or perihæmal space of dorso-ventral lacuna in *Ast.* and *Oph.*; Russo (188).
8. Digestive System:—Coil of gut in *Dendrochirota* different from the type of *Aspidochirota* exc. in *Psolus* and a few species; Östergren (165) p. 102.—Cuvierian organs, structures so called may sometimes be respiratory trees; Östergren (165) p. 108.
9. Vacant.
10. Mesodermal tissues (exc. skeletal):—Radiating muscles from cloaca to body-wall in *Caudina coriacea*; Dendy (45) p. 459.—Dorsal mesentery and rete intestinalis, homologies; Russo (189).
11. Vacant.
12. Genital System:—Generative organs of *Synapta vivipara*; Clark (32) p. 58.—Genital lacuna, its homologies; Russo (189).—Suppression of gonad tuft common in *Aspidochirota* as opposed to *Dendrochirota*, due to different disposition of gut and respiratory trees; Östergren (165) p. 106.

c. *ECHINOIDEA.*

1–4. Vacant.
5. Skeleton:—Apical systems of *Galeropygus*, *Hybodypeus* and *Echinobrissus*; Lambert (128).—Apical systems of *Echinocorys carinatus* (with new enlarged fig.) and of others, abstracted from Janet & Cuenot, Zool. Rec. 1891; Janet (106) pp. 7–11.—Pedicellaria of *Phormosoma uranus* (p. 13), *Sperosoma* (p. 19), *Temnechinus maculatus* (p. 22), *Echinocardium pennatifidum* (p. 26), *Palæotropus hirondellei* (p. 30); Koehler (117).
6. Hydrocoel and associated cavities:—Stewart's organs in *Asthenosoma hystrix* (p. 10), *Phormosoma uranus* (p. 13, pl. ix), *Sperosoma* (p. 20, pl. iv); Koehler (117).
7. Vacant.
8. Digestive System:—Structure of gut, phagocytes, granular cells; Saint-Hilaire (191).—Intestinal siphon in *Phormosoma uranus* (p. 13), *P. placenta* (p. 21), *Sperosoma* (p. 21), course of gut in *Palæotropus hirondellei* (p. 30); Koehler (117).
9. Vacant.
10. Mesodermal Tissues (exc. skeletal):—Mesenteries in *Sperosoma* and *Phormosoma*, representing vertical muscles of *Asthenosoma*; Koehler (117) p. 20, pl. iv.

11 & 12. Vacant.

d. *ASTEROIDEA.*

1. General accounts:—General dissection of internal organs of *Anthenea flavescens* as type of *Ast.*; Parker & Haswell (169) p. 355, figg. 283 & 284.
2. Symmetries:—Planes of bilateral symmetry coincident in larva and adult *Asterias*; Goto (81) p. 240: same in *Asterina gibbosa*; Goto (82) p. 228.

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3. Vacant.

4. Skeletal tissue:—"Krystallkörper" in plates, esp. of dorsal surface, being homogeneous, crystalline areas of stereom passing outwards from about the mid-level of the plate, observed in *Goniodiscus sebæ*, *G. articulatus*, *G. pleyadella*, and in spp. of *Stellaster*, *Anthenea*, *Pentaceros*, *Nidorellia*, *Pentaceropsis*, *Culcita*, *Asteropsis*, *Gymnasteria*, *Phanerastor*; DOEDERLEIN (50) p. 491.

5. Skeleton:—Septal pillars, their value in classification and association with "Krystallkörper" (p. 500); Reticularia, between primary plates, distinguished as outer and inner (p. 501); Distribution of alveolar pedicellaria, the homologies of their basal plates (p. 502); DOEDERLEIN (50).

6. Hydrocoel &c.:—Communication of stone-canal with axial sinus in *Asterias pallida*, *A. tenera*, *Solaster endeca*, *Asterina gibbosa*, *Cribrella sanguinolenta*, *Astropecten bispinosus*; GOTO (81) p. 271: in *Asterias*; GOTO (82) p. 239.

7. Coelom and other Body-cavities:—Their homologies in *Asterina gibbosa*; GOTO (80).

8–12. Vacant.

e. *OPHIUROIDEA.*

1–4. Vacant.

5. Skeleton:—"Glasplättchen," secondary formations in deeper layers of integument in *Ophiomyxa* (p. 770), law of arm-branching in *Gorgonocephalus* (p. 778), hooks on arms of same (p. 780); LUDWIG (141).

6–12. Vacant.

f. *CRINOIDEA.*

1. General:—Generalised description of a simple type of Crinoid, and of chief modifications; BATHER (14).—Terminology of Wachsmuth & Springer criticised; BATHER (15).

2–4. Vacant.

5. Skeleton:—Base, mono- or di-cyclic, relation to abactinal nervous system (p. 422), fusion of basals (p. 426); Radials, simple and compound, their distribution in Inadunata (pp. 419–422); Orals, homologies discussed (p. 523); BATHER (15).—Protective spines on ventral sacs of *Crin.* (p. 252), and on surface of *Crin.* and *Ast.* (pp. 256, 260); BEECHER (17).—Alleged occurrence of pores in ventral sac of Fistulata, esp. *Aulocrinus*, disputed; BATHER (15) p. 525.—Arms, rami, and ramuli; BATHER (15) p. 522.—The arm-fan of *Petalocrinus* (pp. 410–420), including law of arm-branching for *Cyathocrinoidea* (p. 411); BATHER (16).—Covering-plates on genital pinnules of *Antedon bidens*; DOEDERLEIN (48) p. 476.—'Proximale,' new term proposed for persistent proximal columnal of Flexibilia; BATHER (14) p. 341.—Stem-characters discussed (p. 324), origin of cirri (p. 326), evolution of pores in stem (p. 326 and fig.), the dorso-central conception criticised (p. 328); BATHER (15).—Detailed account of "*Cyathocrinus*" *ramosus*, esp. of stem; SPANDEL (201) pp. 21–28, pl. xii.

6–8. Vacant.

9. Nervous System:—Relation of axial cords to mono- and di-cyclic base; BATHER (15) p. 422.

10. Mesodermal tissues, joints:—Distribution of syzygies in *Actinometra paucicirra*; DOEDERLEIN (48) p. 479.

11 & 12. Vacant.

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g. *CYSTIDEA.*
5. Skeleton of *Dinocystis*, new type of Edrioasteroid; BATHER (16A).

h. *BLASTOIDEA.* Vacant.

ii. **Variation**:—

a. In form:—Study of variation in *Iheringia patagonensis*, figures of modes *alatus*, *orbicularis*, *clypeatus*, *ovalis*; LAHILLE (126).

b. In form and surface characters:—Of *Ophioglypha tessellata* including skeletal characters; KOEHLER (117) p. 39.—In shape of spicules of *Holothuria lubrica* (p. 434), in size of tentacles in *Phyllophorus mollis* (p. 437); LUDWIG (138).—Numerous minor variations in spp. of littoral *Oph.*; KOEHLER (118).—Distrib. of spines in *Ophiactis asperula* (p. 754), number of arm-spines in *Ophiomyxa vivipara* (p. 772); LUDWIG (141).—Local races of *Asterias calamaria*; FARQUHAR (60) p. 187.

c. In colour:—In life and alcohol, of various antarctic Holothurians; LUDWIG (137).—Of *Cucumaria leonina*, *C. godeffroyi*, *Phyllophorus mollis*, *P. chilensis*, *Anapta fallax*, *Chiridota pisanii*; LUDWIG (138).—In life, of Jamaican *Ech.* and *Ast.*; CLARK (35).—Blue *Asterina folium*; CLARK (34) p. 408.—Local races of *Stichaster insignis*; FARQUHAR (60) p. 188.—Of *Ophiactis asperula*, *O. kroyeri*, *Amphiura chilensis*, *Ophionereis schayeri*, *Ophiomyxa vivipara*, *Gorgonocephalus chilensis*; LUDWIG (141).—In life, of Jamaica *Oph.*; GRAVE (87).—In spirit (?) of many spp. of littoral *Oph.*; KOEHLER (118).—*Amphiura elegans* reddish not greyish in life; GRIEG (91) p. 26.—Colour of spp. of *Antedon* and *Actinometra*; DOEDERLEIN (48).—Tendency to violet coloration in Bermuda Echinoderms; CLARK (34) p. 409.

d. Meristic variation:—
1. Variation from pentamerous symmetry:—Left anterior ambulacrum almost entirely aborted in *Echinus*; CHADWICK (31).—Loss of right posterior ambulacrum and slight atrophy of genital plates in *Arbacia*; OSBORN (164).—Variation in number of rays of *Asterias tenuispina*; CLARK (34) p. 408.—Hyperactinic, in *Asterias rubens* discussed, 6-rayed specimen figured; GADEAU DE KERVILLE (74) p. 335, pl. ii.—Four cases of hyperactinism, with or without heteractinism, distinguished among *Ophiuroidea*, combined with schizogony in epizootic species; DOEDERLEIN (49) p. 484.—4-rayed *Ophiothrix longipeda*; DOEDERLEIN (49) p. 484.—4-rayed *Ophioglypha albida*; LÖNNBERG (134) p. 49.—Elongation of centrodorsal and hypertrophy of certain radii in *Antedon rhodanica*; NICOLAS (161) p. 132.
2. Reduplication or absence of parts:—in number of Polian vesicles and stone-canals, presence or absence of Cuvierian organs, in *Holothuria lubrica*; LUDWIG (138) p. 434.—Intercalation of an abnormal portion between two normal halves of the arm-fan in *Petalocrinus longus* (p. 432), and arm-fan with an added half in *P. expansus* (p. 434); BATHER (16).

e. Abnormalities:—Left anterior genital shifted forward so that adjacent genitals meet, in a *Salenia*; SIMIONESCU (198) p. 26.

iii. **Secondary Sexual Characters**:—

a. Differences of Form or Structure:—Vacant.

b. Differences of Colour:—Vacant. (See under II, B, ii, c).

c. Protection of Young:—In *Hol.* discussed (p. 4), new cases in *Cucumaria parva* (p. 26), *Psolus antarcticus* (p. 55) and *Chiridota contorta* (p. 77); LUDWIG (137).—Young in body-cavity of *Phyllophorus urna*; LUDWIG (136).—Enlargement of anterior ambulacral

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furrow, possibly as marsupium, in *Schizaster gaudryi*; GREGORY (89) p. 160.—*Lobolithus* as "Brutbefestigungsapparat"; JAHN (105) p. 217.

(C.) PHYSIOLOGY.

i. **General**:—Vacant.

ii. **Circulation**:—Fluid in respiratory trees of *Holothuria* and *Stichopus*, affords support for muscular action; BORDAS (21).

iii. **Respiration**:—Osmosis, respiratory trees, *Holothuria* and *Stichopus*; BORDAS (21).

iv. **Alimentation and Digestion**:—Ectodermal invaginations in Pentactula of *Synapta vivipara*, ? for absorption of nourishment; CLARK (32) p. 67.—Phagocytes in *Ech.* gut; SAINT-HILAIRE (191).—Function of amœbocytes during metamorphosis of *Asterias*, ? assimilate the liquid results of histolysis; GOTO (81) p. 248.

v. **Excretion**:—Probable, by granular cells in *Ech.*; SAINT-HILAIRE (191).—Uric acid and urates in respiratory trees of *Holothuria* and *Stichopus*; BORDAS (21).

vi. **Sensation**:—Reflexes of pedicellaria, spines, podia, and jaws in *Ech.*; UEXKÜLL (208).—Response to shadow in *Centrostephanus*, its relations to the nervous system, and to sight in general; UEXKÜLL (209).

vii. **Miscellanea and Experimental Physiology**:—Amœbocyte formation in parietal lacunae of respiratory trees of *Holothuria* and *Stichopus*; BORDAS (21).—Enterochlorophyll, ?related to pentacrinin and antedonin; NEWBIGIN (160) p. 421.

(D.) BIONOMICS.

i. **General Accounts**:—Vacant.

ii. **Special habits**:—Vacant.

iii. **Habitat**:—Of *Hol.*, *Ech.*, *Ast.* and *Oph.* in Öresund; LÖNNBERG (134) pp. 46–50.—Habitats of Echinoderms at Banyuls; PRUVOT (179).—Habitats of Echinoderms at Roscoff and in G. du Lion; PRUVOT (180) tables.—Effect of various degrees of impurity of water, plants, bacteria, sunlight, other animals, &c. on growth of Echinoid larvæ; VERNON (212 & 213).

Holothurians in mud, their cones of ejection; COUTIÈRE (37) p. 155.—*Caudina coriacea* buried in sand with tip of tail projecting; DENDY (45) p. 463.—*Synapta vivipara* on sea-weed *Acanthophora thierii*; CLARK (32) p. 56.

Asterias calamaria coarse var. upon stones, fine var. under stones; FARQUHAR (60) p. 188.

Roots of sea-weed, serving for transport, *Ophiactis kroyeri*; LUDWIG (141) p. 756.—On gorgonids—*Ophiactis macrolepidota*; on alcyonian *Spongodes*—*O. brachyura*; on gorgonids, *Spongodes* and arms of *Ophiacantha*—*Ophiothela danæ*; on cirri of *Actinometra*—*Ophiophthirius*; on gorgonid *Mopsea*—*Astroschema koehleri*; on gorgonid *Melitæa*—*Euryale ludwigi*; DOEDERLEIN (49).—*Ophioscolex glacialis* on *Lophohelia prolifera*, *Gorgonocephalus lincki* on *Paragorgia arborea* and *G. lamarcki* on *Duva* sp.; GRIEG (91) p. 27.—Triassic *Oph.* in empty Lamellibranch shells; ENGEL (56) p. lvi.

Pentacrini of Lias attached to floating drift-wood, and so escape attacks of *Myzostoma*; FRAAS (70).—*Pentacrini* as evidence of depth; POMPECKJ (176) p. 761.

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iv. **Feeding**:—Food of *Synapta vivipara*; CLARK (32) p. 56.—Food of *Phyllophorus chilensis* distinct from that of *P. mollis*; LUDWIG (138) p. 441.

v. **Defence and Protection**:—

a. Active:—*Holothuria forskali*, the Cotton-spinner, fight with *Carcinus mænas*; CUENOT (40) p. 42, fig. 3.

b. Concealment:—*Phyllophorus mollis* covers itself with stones; LUDWIG (138) p. 441.—*Phyllophorus pellucidus*, which lives among red algæ or dead zostera, is of a beautiful reddish yellow, and often covers itself with zostera leaves; LÖNNBERG (134) p. 47.

c. Protective coloration:—*Synapta vivipara* coloured like seaweed on which it lives; CLARK (32) p. 56. (Cf. II, B, ii, c: iii, b.)

vi. **Locomotion**:—Vacant.

vii. **Autotomy and Regeneration**:—Experimental study of regeneration in *Asterias vulgaris*; KING (114).—Regeneration of *Linkia* correlated with exposure to force of waves; COUTIÈRE (37) p. 89.—Schizogony resulting in hyperactinism in epizootic *Oph*; DOEDERLEIN (49) p. 483.—Disc-covering, along with gonads, thrown off by *Ophiocnida echinata* and *Amphiura grisea*, probably periodically and as a method of reproduction; SLUITER (199).

viii. **Parasites and Commensals**:—Parasitic gastropod, *? Entocolax*, in *Chiridota pisanii*; LUDWIG (138) p. 446.—Small brown calcareous sponge firmly attached to skin of *Synapta vivipara* just behind the circle of tentacles; CLARK (32) p. 56.—*Stichopus* sp. living in cavities of madrepore-reef shelters the fish *Euchelyophis vermicularis*; COUTIÈRE (38) p. 240.—*Hippolytina*, a small Crustacean, sheltered by *Culcita*; a small fish, probably *Engraulis*, shelters among spines of *Diadema setosum* and feeds on *Posidonia*; COUTIÈRE (38) p. 238.—Mollusc *Montacuta substriata* among spines of ventral side in *Spatangus purpureus*; GRIEG (91) p. 27.—Parasitic Copepod, *Pionodesmotes*, bores into ventral surface of test in adult *Phormosoma uranus*, which forms internal galls; KOEHLER (117) pp. 14 & 61, pl. x.—Ostracod, *Cypridina globosa*, very frequently found on *Toxopneustes droebachiensis*, on a spine near anus; LÖNNBERG (134) p. 37.—*Millericrinus horridus* bored by *Myzostoma*; BOEHM (20) p. 675.—Parasites (*? Myzostoma*) common on *Apiocrinidæ* of Ober Weiss-Jura, rare on *Encrini* of Muschelkalk, absent from *Pentacrini* of Lias; FRAAS (70).

ix. **Echinoderms as Food**:—*Hipponoe* eaten by natives of Jamaica; CLARK (33) p. 164.

As food for fish,—*Psammechinus pulchellus* in *Pagellus erythrinus*, *Strongylocentrotus lividus* in *Labrus merula*, *Cidaris* in *Crenilabrus pavo*, *Ophiura* in *Julis vulgaris*; GOURRET (83).—*Ophioglypha texturata* in *Trigla lyra*, *Asterina gibbosa* in *Box salpa*, *Antedon mediterranea* in *Labrus mixtus*; GOURRET (84).—Plates of a cidarid in coprolite, Miocene; SCHAFFER (193) p. 546.

x. **Echinoderms as Rock-formers**:—Jurassic, chiefly *Crin.* also *Ech.* and *Ast.*; GIRARDOT (79) pp. 163, 190, 192, 205, 253, 283, 292.—Rôle of Crinoidea in Silurian reef-building as seen in Gotland; WIMAN (225), pp. 319, 322, 323.—Echinoderms as constituents of Chalk; CAYEUX (30) pp. 218, 222, 227, 235, 239, 244, 248, 253, 256, 261, 266, 268, 271, 274, 276, 278, 280, 290, 294, 296, 298, 299, 301, 304, 309, 310, 312, 315, 317, 329, 339, 342, 360, 372, 374, 393, 409, 411, 413, 445.—Neritic Sand forming on floor of Irish Sea, largely Echinoid spines; HERDMAN (99) p. 215 and tables.

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(E.) MISCELLANEOUS.

i. **Research and Instruction**:—

a. Preservation:—Of colours of Echinoderms in formalin; Wolfenden (227) p. 2.—Of larvæ of *Asterias pallida*; Goto (81) p. 239.—Killing and preservation of young *Synapta vivipara*; Clark (32) p. 53.

b. Methods of research:—Application of X-rays to study of Echinoderms; Wolfenden (227).

c. Museum Exhibits and Collections:—Fossils in Musée Géologique de l'Université, St Pétersbourg, with names of historical collections, and figures of *Asteroblastus stellatus*, *Mesites pusireffskii*, *Protocrinus primordialis*, and *Hemicosmites malum*; St Petersburg, Imp. Univ. (192) pp. 37, 39, 41, 43, 47.—List of historical specimens of Ordovician *Ast.*, *Crin.*, *Cyst.* in Amer. Mus. Nat. Hist.; Whitfield & Hovey (224) pp. 24–27.

d. Instruction:—Practical guide to dissection of *Asterias rubens*, *Echinus esculentus*, and *Holothuria tubulosa*, with original figures of *A. rubens* dissected from dorsal surface, madreporite, oral nervesystem, and sections of ray of same, dorsal surface, peristome, and jaws of *E. esculentus*; Kükenthal (123) pp. 108–128. Text-books; Lahusen (127), Parker (169), Roule (185).

ii. **Economics**:—*Asterias rubens* used for manure; Gadeau de Kerville (74) p. 335.—Crinoid columnals, star-stones, at Étoile, used as ornaments, toys, and trademark; Girardot (79) p. 163. Bajocian star-stones mounted as ornaments at Digne; Nicolas (161) p. 138.

iii. **Bibliography**:—Of Antarctic *Hol.*; Ludwig (137) p. 94.—Of Echinoderm larvæ; Mortensen (156) p. 160, and (157).—Literature of Echinoderma for 1897, with abstracts; Ludwig (139).—Index to names of American fossil Echinoderms, chiefly *Crin.*, and mostly published between 1889 and 1892, with (on p. 683) discussion of validity of J. Hall "Descr. of n. spp. of Crinoidea, from investigations of the Iowa Geol. Surv., Prelim. notice" 1861; Miller (153) pp. 672–683.—Similar Index to names mostly published between 1892 and 1897, with remarks on date of Miller (187) Zool. Rec. 1893, and Wachsmuth & Springer (50) Zool. Rec. 1892; Miller (154) pp. 719, 730–755.

iv. **Historical, Popular notions, &c.**:—Account of literature of Crinoids by Wachsmuth & Springer [(336) Zool. Rec. 1897,] criticised; Bather (15) p. 280.—Early history of *Pentacrinos*, *Encrinos*, *Asteria*; Bather (13).

Fishermen's names for *Arbacia pustulosa* "oursin juif," and *Echinocardium cordatum* "oursin blanc des sables," in Algeria; Pallary (168).—*Ophiothrix fragilis* called "le Traplus" by fishermen of Calvados; Gadeau de Kerville (74) p. 337.—*Asterias rubens* called "la Fifotte" by fishermen of Calvados; Gadeau de Kerville (74) p. 334.—"Corrupio," local Brazilian name of *Toxopneustes variegatus*, and "pindá" local name of *Encope emarginata*; Ihering (102) p. 155.—*Clypeaster ægyptiacus* called "Chell," plural "chelloul" by Bedouins; Fourtau (68) p. 40.

(F.) AUXOLOGY.

i. **General Principles**:—Vacant.

ii. **General Accounts**:—Vacant.

iii. **Formation of Gonads**:—Sexes distinct in *Ophiomyxa vivipara*, ovum described; Ludwig (141) p. 773.—♀ *Cucumaria crocea*;

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LUDWIG (137) p. 19.—*Pseudopsolus macquariensis* is ♀; LUDWIG (137) p. 51.—Spermatogenesis and oogenesis in *Asterina gibbosa* (p. 279), with protandry in races at Roscoff and Banyuls, but sexual polymorphism at Naples, also ♀ *Asterias glacialis* (p. 273 footnote); CUÉNOT (41).—Filaments in maturing ovum of *Asterina gibbosa*; BOUIN (22).—Unripe ova of *Hol.* and *Ech.*, described, their response to spermatozoa; IWANZOFF (104).—Maturation of ovum and passage into body-cavity in *Synapta vivipara*; CLARK (32) p. 58.

iv. **Oviposition, Fertilisation, and Segmentation**:—Breeding of *Echinarachnius parma* and *Ast.* Woods Holl, March 1898; BUMPUS (23).—Various Echinoderms breeding in April at Woods Holl; MEAD (149).—Breeding of *Ech.*, *Ast.*, *Oph.*, *Hol.* at Woods Holl, summer 1898, see *Echinarachnius*, *Arbacia*, *Ophiopholis*, *Ophiura*, *Thyone*, and *Synapta*; BUMPUS (24) p. 855.—Breeding period of *Cucumaria crocea*; LUDWIG (137) p. 24.—Breeding season of *Phyllophorus urna*, young in body-cavity; LUDWIG (136).—Breeding period and mode of birth of *Synapta vivipara* (p. 57), fertilisation and segmentation (p. 58); CLARK (32).—Breeding period of *Solaster endeca*, colour of eggs; GRIEG (91) p. 25.—Breeding period of *Luidia savignyi*; M'INTOSH (143) p. 108.—Breeding period of *Toxopneustes variegatus*, *Hipponoe esculenta*, and *Echinoneus semilunaris*, at Jamaica; CLARK (35).—Breeding period of *Ophiocoma echinata*, *O. risei*, and *Ophiura appressa*, at Jamaica; GRAVE (87).—*Ophiactis kroyeri* carries its young, ? viviparous; LUDWIG (141) p. 759.

Segmentation of *Ech.* ovum; FOL (63) pp. 261–269, 283, 292, 296.—Fertilisation and segmentation of ovum in *Sphærechinus* and *Asterias*; ERLANGER (59).—Autofecundation in *Asterina gibbosa* (p. 278), in *Asterias glacialis* (p. 274 footnote); CUÉNOT (41).—Pseudopodia connecting cells in blastula of "Starfish common at Roscoff" and segmenting ovum of "the common echinus of Roscoff"; ANDREWS (8) pp. 6–9 and figg. 1–3.

v. **Larval Stages**:—

a. Rarity of Echinoderm larvæ in Kingston Harbour, Jamaica, summer of 1896; CLARK (33) p. 165.—Discussion of all known Echinoderm larvæ, exc. *Crin.*, terminology with tables of terms, homologies of parts with comparative text-figg., orientation, determination of spp., systematic description, occurrence and distribution, bibliography; MORTENSEN (156 & 157).

b. The Pentactula of *Synapta vivipara*; CLARK (32) p. 63.—Development of *Synapta vivipara*; GEROULD (77).—Later larval stages of *Phyllophorus urna*; LUDWIG (136).—Description of young *Psolus antarcticus*; LUDWIG (137) p. 56.—Young *Cucumaria crocea*, development (p. 20): young *Cucumaria parva* described and figd. (p. 26, pl. i): young of *Cucumaria lævigata* (p. 35): young of *Chiridota contorta* (p. 80); LUDWIG (137).

c. Vacant.

d. Development of larva and metamorphosis in *Asterias pallida*; GOTO (81).—Goto's discrepancies from MacBride ascribed to imperfect methods of preparation; MACBRIDE (142).—Origin of body-cavities in larva of *Asterina gibbosa* and their relations in the adult; GOTO (80).—Preoral lobe, mucous glands (p. 230), origin of cœlomic cavities and differences from MacBride's account, *Asterina gibbosa*; GOTO (82).—*Bipinnaria* with young *Luidia* descr. and figd.; M'INTOSH (143).

e. From ovum to pluteus in *Ophiocoma echinata*; GRAVE (86).

f, g, h. Vacant.

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vi. **Organogeny** :—

a. *Echinoderma* :—

4. Stereom formation, "Kalksalze in einer spärlichen organischen Intercellularsubstanz abgelagert"; Fol (63) pp. 338, 347.

b. *Holothurioidea* :—

1. Derivation of organs of *Synapta vivipara* from germ-layers of gastrula; Clark (32) p. 74.

4. Origin of calcareous structures in *Synapta vivipara*; Clark (32) pp. 67, 69, 72.—Stages in development of spicules in *Phyllophorus urna*; Ludwig (136) p. 98.

6. Origin of hydrocœl, tentacles, and radial water canals in *Synapta vivipara*; Clark (32) pp. 62, 68.—Stone-canal and pore-canal in larva of *Phyllophorus urna*; Ludwig (136) p. 98.

7. Origin of circumœsophageal sinus (p. 64), of blood-vascular system (p. 71), in *Synapta vivipara*; Clark (32).

8. Origin of digestive tract in *Synapta vivipara*; Clark (32) pp. 65, 70.

9. Origin of nervous-system and sense-organs in *Synapta vivipara*; Clark (32) pp. 66, 72.

10. Origin of muscles in *Synapta vivipara*; Clark (32) p. 70.

12. Origin of generative systems in *Synapta vivipara*; Clark (32) pp. 71, 72.

c. *Echinoidea* :—Vacant.

d. *Asteroidea* :—

6. Origin of hydrocœl (p. 252) and of stone-canal in *Asterias*, its distinctness from pore-canal emphasized (p. 258); Goto (81).—Origin of hydrocœl (p. 231) and of stone-canal in *Asterina* (p. 235); Goto (82).

7. Origin of cœlomic cavities of adult *Asterias* (p. 252): Perihæmal and peribranchial cavities in *Asterias pallida* are schizocœlic from mesenchyme (p. 274); Goto (81).—Origin of cœlomic cavities of adult *Asterina* (p. 231): Origin of perihæmal system in *Asterina*, partly enterocœlic (p. 235); Goto (82).

8. Origin of adult gut in *Asterias*; Goto (81) p. 249.

10. "Mesodermic muscle fibres" "secreted on the surface turned away from the cavity" of hydrocœl and enterocœl in *Asterias pallida*; Goto (81) p. 272.

e. *Ophiuroidea* :—

5. Late origin of supplementary dorsal shields in *Ophionereis schayeri* (p. 766), increase in number of arm-spines of same (p. 767), growth of arms in *Gorgonocephalus* (pp. 778, 781); Ludwig (141).

f, g, h. Vacant.

vii. **Post-larval Growth-stages** :—

b. *Holothurioidea* :—Spicules of *Phyllophorus urna* pass from an Elpidiine stage in larva, to the form typical of genus, and then give place in old age to secondary rosettes; this different in *P. granulatus*; Ludwig (136) p. 98.—Change in spicules of *Cucumaria lævigata* with advancing age; Ludwig (137) p. 33.—*Holothuria aphanes* believed to represent young of *H. impatiens*, the chief difference being in the spicules which disappear in the larger *H. aphanes*, and are after an interval replaced by others of *H. impatiens* type; Östergren (166).

c. *Echinoidea* :—Neanic *Phormosoma uranus*, 5–25 mm. diam., development of peristome and periproct; Koehler (117) p. 13.

d. *Asteroidea* :—Growth stages in *Goniodiscus sebæ* discussed in detail, showing gradual change from neanic stage, *Hosea spinulosa*,

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to gerontic *Culcita* stage, which is the phyletic successor; in other words *Pentagonasterinæ*, *Goniodiscinæ*, and *Pentacerotidæ*, are phyloneanic, phylephebic, phylogerontic; DOEDERLEIN (50) p. 494.—Brephic *Asterina exigua;* PARKER & HASWELL (169) p. 361, fig. 291.—Addition of arms in *Asterias calamaria*, a giant specimen; FARQUHAR (60) p. 188.

e. *Ophiuroidea*:—Brephic stages of *Ophiomyxa vivipara* measured and described; LUDWIG (141) p. 773. See also under vi. e. 5 for growth changes in *Ophionereis* and *Gorgonocephalus*.

f. *Crinoidea*:—Neanic *Actinometra belli*, brachia; DOEDERLEIN (48) p. 479.

viii. **Developmental mechanics and Experimental Embryology**:—Summary of recent work in experimental cytology, with references to Echinoderms on pp. 11, 21, 63, 67, 68, 70, 77, 78, 84, 90, 97, 98, 100, 121, 128, 132, 138, 139, 144; LABBÉ (124).

Theoretical organisation of the Echinoderm ovum, as compared with others, with new experiments on partial segmentation after fragmentation of ovum; DRIESCH (52).—When do the elementary morphogenetic processes come to an end in ontogeny?, e.g. when can segmentation be said to cease? Attempt to answer by counting the number of cells in entire and fragmented larvæ, e.g. mesenchyme cells in *Sphærechinus* larvæ, archenteron cells in *Asterias glacialis*; DRIESCH (53).—Is end of segmentation determined by number or by size of cells? Attempt to answer by counting cells in blastulæ and demiblastulæ of *Sphærechinus*; MORGAN (155).—Ovum of *Strongylocentrotus lividus* divided by hand into portion with nucleus and centrosome and portion with cytoplasm alone; the latter was fertilised and formed gastrula with nucleated cells; DELAGE (43).—Spermovum of *Echinus* artificially divided into portion with sperm-nucleus and portion with ovo-nucleus, and subsequent segmentation of the former; ZIEGLER (230) part I.

Hybrid-larvae:—Of *Strongylocentrotus lividus*, *Sphærechinus granularis*, *Echinus microtuberculatus*, *E. acutus*, *Echinocardium cordatum*, *E. mediterraneum*, *Arbacia*, *Dorocidaris*, prepotency of ♂ or ♀ varies as relative maturity of gonads; also slight infertility between colour vars. of same sp.; VERNON (214).—Of *Ech.* follow the characters of the ♀ in earliest stages, proved by experiments with *Echinus microtuberculatus*, *Sphærechinus granularis*, *Strongylocentrotus lividus*, and *Arbacia pustulosa*; DRIESCH (54).—Bastardisation; ACKERMANN (1).

Irregularity of mitosis and segmentation in ovum of *Echinus microtuberculatus*, with criticism of Boveri (42) Zool. Rec. 1897; ZIEGLER (230) part II.

Effect of different conditions of sea-water on growth of larvæ of *Strongylocentrotus lividus*; VERNON (212).—Effect of vegetable life, of fouling by animal life, including Holothurians and other Echinoids, on growth of larvæ of *Strongylocentrotus*, *Sphærechinus*, and *Echinus*; VERNON (213).—Development of eggs of *Arbacia* hastened by alkali (NaHO, 6/1000%), checked by acid (HCl); LOEB (132).—Effect on developing larvæ of *Echinus microtuberculatus* and *Asterias glacialis*, of lithium bromide, potassium sulphocyanide, and sodium butyrate, with general résumé of previous results; HERBST (96).—Phosphorus, sulphur, chlorine, sodium, potassium, magnesium, calcium carbonate, and iron, necessary for complete development of *Ech.* and *Ast.* larva; HERBST (97).—Phosphorus and iron not necessary for development of *Ech.* larva; HERBST (98).

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III. DISTRIBUTION.

A. GEOGRAPHICAL.

i. **General**:—Distrib. of Echinoderm larvæ, and relation to distrib. of Echinoderms in general; MORTENSEN (156) p. 153, and (157) p. 108. —Distrib. of brephic *Ech.*, *Ast.*, *Oph.*, *Hol.*, by floating in currents, and supposed similar transference of Miocene Mediterranean forms across the Atlantic, also migration along bottom; AGASSIZ (2) pp. 71–73.—Varying capability for distribution, *Ech.*, *Ast.*, *Oph.*, *Hol.*; FARQUHAR (61) p. 303.

Comparison of Antarctic and Arctic *Holothuriidæ* (p. 9) *Elpidiidæ* (p. 11) *Cucumariidæ* (pp. 13, 57) *Molpadiidæ* (p. 66) *Synaptidæ* (p. 88) and *Hol.* in general (p. 90), no support to Bipolar hypothesis; LUDWIG (137).

ii. **Atlantic Ocean and adjacent Seas**:—Various localities, *Hol.* dredged by 'Travailleur' and 'Talisman'; PERRIER (172).

Scandinavia:—Norway. Vaagsfjord and Ulvesund, outer Nordfjord, list of *Hol.*, *Ech.*, *Ast.*, *Oph.*, *Crin.*, with habitats of some spp. mentioned; GRIEG (91) p. 24.—W. Norway, probably Molde, *Pseudocucumis*; ÖSTERGREN (165) p. 135.—Öresund, spp. of *Hol.*, *Ech.*, *Ast.*, *Oph.*, notably *Asterias hispida* and *Ophioglypha sarsi*, general northerly character of Echinoderm fauna, habitats and depths noted (pp. 46–50), also genera classified according to nature of bottom (pp. 58–62), origin of the fauna and comparison with Greenland and Norwegian fjords (pp. 65–72); LÖNNBERG (134).

British Coasts:—Orkneys, *Asterias murrayi* 25 fms., *Echinocardium pennatifidum* 35 fms., also *Astropecten*, *Solaster*, *Luidia*, *Palmipes*, *Porania*, *Henricia*, *Spatangus*, *Echinus*, *Ophiocoma* and *Ophiura*; WOLFENDEN (227).—Moray Firth, Firth of Clyde, Loch Fyne, organisms captured, with stations and dates; FULTON (73); the same with addition of Firth of Forth and St Andrews B.; FULTON (72).—Loch Fyne, list of Echinoderms with depths, spp. of *Antedon*, *Porania*, *Stichaster*, *Solaster*, *Henricia*, *Asterias*, *Ophiura*, *Amphiura*, *Ophiopholis*, *Ophiocoma*, *Ophiothrix fragilis*, *Echinus*, *Spatangus*, *Echinocardium*, *Brissopsis*, *Synapta*, *Cucumaria*, *Thyone*, *Psolus*, and *Cribella* and *Ophiactis*; SCOTT (195).—St Andrews Bay, 5–6 fms., 30 Sept. 1896, *Bipinnaria asterigera*; occurrence of *Luidia ciliaris*, *L. sarsi*, and *L. savignyi* noted; M'INTOSH (143).—Falmouth, *Antedon rosacea* supplanted by *Ophiocoma nigra*; VALLENTIN (210).

French Coasts:—Normandy, Echinoderm fauna; GADEAU DE KERVILLE (74).—*Echinoderma* of Roscoff and of G. du Lion comparative lists; PRUVOT (180) tables.—B. of Biscay, spp. of *Echinus*, *Psammechinus*, *Echinocardium*, *Echinocyamus*, *Ophioglypha*, *Ophiocten*, *Ophiactis*, *Amphiura*, *Ophiacantha*, *Ophiothrix*, dredged by l'Hirondelle, with depths and nature of bottom; KOEHLER (117).

Mediterranean:—G. du Lion, Banyuls. Lists and habitat of Echinoderms; PRUVOT (179 & 180).—Cette, list and distribution of of Echinoderms in l'étang des eaux-blanches, partly brackish; GOURRET (85) p. 21.—*Asterias rubens* acclimatised at Cette, *Echinocardium pennatifidum* found with *E. cordatum* at Tamaris-sur-Mer (Var); KOEHLER (120).—G. of Naples, *Synapta inhærens*, *S. macrankyra* n. s., *S. digitata*, and *S. thomsoni*, with comparative distrib. of those spp.; LUDWIG (135).—Coast of Algiers, G. of Oran, list of *Ech.*, 10 spp. of *Dorocidaris*, *Arbacia*, *Arbacina*, *Echinus*, *Sphærechinus*, *Strongylocentrotus*, *Echinocyamus*, *Echinocardium*, *Brissus*; PALLARY (168): *Arbacina pallaryi* n. s.; GAUTHIER (76) p. 840.—

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Dardanelles and Bosphorus, list and distribution of Echinoderms; MARION (146) pp. 166 & 172.

Azores:—spp. of *Antedon*, *Dorocidaris*, *Cidaris*, *Arbacia*, *Salenia*, *Asthenosoma*, *Phormosoma*, *Sperosoma*, *Temnechinus*, *Trigonocidaris*, *Echinus*, *Sphærechinus*, *Strongylocentrotus*, *Echinocyamus*, *Brissopsis*, *Palæotropus*, *Ophioglypha*, *Ophiomusium*, *Ophiocten*, *Ophiactis*, *Amphiura*, *Ophiacantha*, *Ophioconis*, *Ophiothrix*, dredged by l'Hirondelle, with depths and nature of bottom; KOEHLER (117).

American Coast:—Newfoundland, spp. of *Strongylocentrotus*, *Echinarachnius*, *Ophioglypha*, *Ophiomusium*, *Ophiocten*, *Ophiopholis*, *Amphiura*, *Ophiacantha*, *Gorgonocephalus*, dredged by l'Hirondelle, with depths and nature of bottom; KOEHLER (117).—Coldspring Harbor, Long Id., *Asterias forbesi*, *Arbacia punctulata*, *Synapta girardi*, *S. roseola*; DAVENPORT (42) p. 686.—Jamaica, general account of marine fauna with habitats of Echinoderma; CLARK (33).—List of *Ech.* and *Ast.* with habitat, and other notes; CLARK (35).—List of *Oph.* with habitat and other notes; GRAVE (87).—Bermuda, list of littoral Echinoderms; CLARK (34).

S. Atlantic:—Ilha de S. Sebastião, *Ech.*, *Ast.*, *Crin.*; IHERING (102) p. 155.

iii. **Indian Ocean and adjacent Seas**:—Littoral *Oph.* collected by 'Investigator,' with comparative distrib. for each sp., and (on p. 116) a complete list of spp. from Indo-Pacific region, note n. spp. and n. varr. of *Ophiolepis*, *Amphiura*, *Ophiopsila*, *Ophiocoma*, *Ophiacantha*, *Ophiomaza*, *Ophiothela*, *Ophiothrix*, *Ophiomyxa*, and *Sthenocephalus* n. g.; KOEHLER (118).

Red Sea:—Djibouti, echinoderm fauna of madrepore reefs; COUTIÈRE (37) pp. 88, 155.

Trawls of 'Investigator' between Bombay and Ceylon, *Hol.*, *Oph.* (one haul of "several thousands of specimens of some twelve different species"), *Persephonaster rhodopeplus*, *Zoroaster*, also *Phormosoma tenue*, *Cœlopleurus maillardi*, *Hemipedina mirabilis*, and *Platybrissus rœmeri*, new to the Indian fauna; ANDERSON (7).—Ceylon, 34 fms., *Ophiothrix innocens* n. s.; KOEHLER (121).—Andaman Is., Coromandel, Ceylon, and Laccadives, *Sphærothuria bitentaculata*; KOEHLER (119).

Amboina and Thursday Id., spp. of *Antedon* and *Actinometra*; DOEDERLEIN (48): spp. of *Ophiactis*, *Ophiothela*, *Ophiophthirius*, *Astroschema*; DOEDERLEIN (49).

iv. **Pacific Ocean and adjacent Seas**:—G. of Panama and G. of California, n. spp. of *Dorocidaris*, *Porocidaris*, *Salenia*, *Dialithocidaris*, n. g., *Dermatodiadema*, n. g., *Phormosoma*, *Pourtalesia*, *Plexechinus*, n. g., *Echinocrepis*, *Urechinus*, *Cystechinus*, *Phrissocystis*, n. g. [this is *not* a recent Cystid], *Homolampas*, *Aerope*, *Schizaster*, *Periaster*, *Brissopsis*, *Toxobrissus*; AGASSIZ (2).

Lists of *Hol.* from Chile and Peru compared with those from Magellan, and Juan Fernandez, the last including *Holothuria platei* and *Chiridota fernandensis*, n. spp.; LUDWIG (138).—Chile and Juan Fernandez, spp. of *Ophioglypha*, *Ophiactis*, *Amphiura*, *Ophionereis*, *Ophiomyxa*, and *Gorgonocephalus*, relation of Juan Fernandez and New Zealand faunas; LUDWIG (141).

New Zealand, general discussion of Echinoderm fauna, and list with locc. and synn., definition of the N. Z. area; FARQUHAR (61): *Asterias*, *Stichaster*, and *Cribrella* with *C. lukinsi*, n. sp.; FARQUHAR (60).—New Brighton beach, near Christchurch, *Caudina*, *Colochirus*, *Echinocardium*, thrown up by storm; DENDY (46) p. 323.

Philippines:—List of Echinoderms; CASTO DE ELERA (28).

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Japan :—n. spp. of *Cidaris*, *Mespilia*, *Salmacopsis*, *Echinostrephus*, *Echinus*, *Fibularia*, and *Echinarachnius*; YOSHIWARA (228).

v. **Arctic Ocean and adjacent Seas** :—White Sea, *Asterias stellionura* in great numbers; KNIPOWITSCH (116) p. 318.

vi. **Antarctic Ocean and adjacent Seas**:—Antarctic in wide sense, to 40° S., discussion of *Hol.*, by species, by families, and in general; LUDWIG (137).—Falkland Is., List of Echinoderms collected at Hill Cove, West Id., Sept. and Oct., 1896, with comparative distribution, new occurrences are *Ophiothrix magnifica* and *Ophiomyxa vivipara*; PRATT (178) pp. 17–19.

B. GEOLOGICAL.

(i) GENERAL.

Echinoderma [sc. *Echinoidea*] not of much value in synchronising deposits; JUKES-BROWNE (107).—"Mieux que n'importe quel fossile, les échinides permettent de déterminer les âges de couches"; LAHILLE (126) p. 448.—General distribution of fossil *Hol.* Lower Carboniferous to Upper Jurassic; SPANDEL (201) pp. 40–43.

(ii) CAINOZOIC.

a. **General** :—Tertiary of Algeria, *Ech.*, *Ast.*, *Oph.*, *Crin.*; POMEL (175).—Australia, older Tertiary, corrections in list of *Ech.*; TATE (205), pp. 411 & 412.

b. **Pleistocene** :—Saharian, Cairo, comparative list of *Ech.*; MAYER-EYMAR (148) p. 64.—Suez Canal, *Laganum depressum*; GREGORY (89) p. 153.—Plain of Tor near Sinai, *Laganum sinaiticum*, *Clypeaster placunarius*; FOURTAU (69) p. 18.—Cuba, spp. of *Clypeaster*, *Echinoneus*, *Hemiaster*, and *Brissus*; EGOZCUE (55).

c. **Pleiocene** :—St. Erth, Cornwall, Echinoderms including *Echinus etheridgei*, n. sp.; BELL (18) p. 165.—Great Pyramid, *Clypeaster ægyptiacus*, correct horizon; FOURTAU (68).—Middle California, *vide sub* Miocene.

c & d. **Pleiocene and Meiocene** of Piedmont and Liguria, spines of *Diadema desori*; FORNASINI (64), and SACCO (190) p. 73.

d. **Meiocene** :—near Avignon,—uncritical lists of *Ech.*, preliminary descriptions of n. spp. of *Antedon* and *Pentacr. berthei*, n. sp.; NICOLAS (161), pp. 104, 107, 108, 114, 129–138: revision of *Antedon* and *Pentacrinus* [i.e. *Isocrinus*]; NICOLAS (162). See also PELLAT (170).—"Tegel" of Theben-Neudorf, Hungary, list of *Ech.*; SCHAFFER (193) p. 535.—Valley of Aniene, Italy, list of *Ech.*, with *Echinolampas mazzettii*, n. sp.; ANGELIS d'OSSAT (9) p. 291.—Cuba, spp. of *Laganum*, *Clypeaster*, *Encope*, *Echinolampas*, *Brissopsis*, *Schizaster*, and *Macropneustes*; EGOZCUE (55).—Middle California, distribution of *Ech.* in Quaternary, Merced, San Pablo, and Contra Costa co. series; MERRIAM (151).—Beaumaris near Melbourne, *Lovenia forbesi*, *Orthologhus lineatus*, *Clypeaster gippslandicus*, *Monostychia australis*, *Pericosmus* sp.; HALL (94) pp. 191, 195.

Middle Miocene :—Schwaben, *Scutella paulensis*; RÜHL (187) p. 379.—Biklista-Kutsh, N. Greece, *Clypeaster*; PENECKE (171) p. 64.

Helvetian, Egypt, *Psammechinus*, *Echinolampas*, *Pericosmus*; GREGORY (89).

d & e. *Helvetian* and *Bartonian* of Piedmont, *Pentaceros*; SACCO (190) p. 72.

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e. **Oligocene** :—*Upper* :—Doberg bei Bünde, Germany, *Echinolampas eberti*, n. sp. ; OPPENHEIM (168).—N. Greece, *Cidaris* and a Spatangid ; PENECKE (171) p. 51.

f. **Eocene** :—*Gualteria orbignyi* at Blaye ; ENGERRAND (57).—Horizons of *Sismondia* and localities of Echinologists in Egypt ; FOURTAU (67).—Cuba, spp. of *Echinopedina*, *Echinanthus*, *Echinolampas*, *Asterostoma*, *Macropneustes*, and (?) *Hemiaster* and *Breynia* ; EGOZCUE (55).—Virginia, middle Atlantic slope, diadematoid and spatangoid remains ; CLARK (36).—Croydon bore, S. Australia, *Fibularia gregata*, *Scutella marsupiata* [nom. nud.] *Echinolampas murrayanus*, spp. of *Pentacr.* and *Antedon* (p. 196), Ki-ki bore, S. A., spp. of *Cidaris* and *Pentacr.* (p. 199) ; TATE (206).—Royal Park near Melbourne ; *Psammechinus woodsi*, ? *Toxobrissus* sp. ; HALL (94) p. 207. Lower Maude beds, Victoria, comparative list of *Ech.* various localities (p. 157), with corrections of list from Waurn Ponds (p. 159), Botesford Limestone (p. 160), limestone of Spring Creek (p. 162) ; HALL (93).

? Upper Eocene, *Iheringia* ; LAHILLE (126) p. 446.

Nummulitic—between Sallèles and Villegly (Aude) *Spatangus obesus*, *Schizaster rousseli*, *Pygorhynchus gauthieri*, *Cyphosoma* ; SICARD (196) p. 17.—Bague de Bordeillat at La Manère, E. Pyrenees, *Cidaris pseudo-serrata* ; ROUSSEL (186) p. 293.—Erratics, Schwaben, *Pentacr.*, *Conoclypeus*, *Cidaris* ; RÜHL (187) p. 334.—Roumania, *Conoclypeus conicus* and *Rhizocrinus piriformis* ; POPOVICI-HATZEG (177) p. 134.—Egypt, n. spp. of *Sismondia*, *Conoclypeus*, *Pygorhynchus*, *Semiclypeus*, *Echinolampas*, *Nucleolites*, *Hemiaster*, *Brissopsis*, *Linthia*, *Schizaster*, *Macropneustes*, and esp. of *Pygurus*, *Caratomus*, and *Epiaster* previously unknown in Tertiary ; MAYER-EYMAR (147).

Bartonian, Mokattam, and Libyan series, Egypt, *Rhabdocidaris*, *Conoclypeus*, *Rhynchopygus*, *Echinolampas*, *Eupatagus*, *Hypsopatagus*, *Hemiaster*, *Linthia*, *Schizaster* ; GREGORY (89).—"Étage Lybien, sous-étage Sparnacien, couches à *Callianassa nilotica*, du Gebel Drounka, à Assiout, Égypte" contains *Anizaster gibberulus*, *Echinolampas crameri*, *Euspatangus cairensis*, *Thagastea luciani* ; FOURTAU (66) p. 84.—Nummulitic limestone near Sinai, *Echinolampas africanus* ; FOURTAU (69) p. 16.—Middle or lower Eocene, Aintâb, Syria, spp. of *Schizaster* and *Pericosmus* ; KINKELIN (115) p. 162.—Mid. Eocene, Venetia and S. Tirol, n. spp. of *Brissopatagus*, *Linthia*, and *Echinolampas* ; OPPENHEIM (163).

Lutetian—Calcaire grossier supérieur in Gironde, near Blaye, list of *Ech.* esp. *Linthia* ; ENGERRAND (58) : road from Ecos to Dampmesnil (Eure), *Macropneustes minor* ; CANU (48) in Zool. Rec. 1897.

Jackson stage, N. W. Louisiana, *Scutella* ; VAUGHAN (211).

(iii) MESOZOIC.

a. **General** :—Vacant.

b. **Cretaceous** :—Echinodermal evidence as to depth at which the Chalk was deposited (p. 506), as to rapidity (p. 542), as to currents (pp. 545, 551, 552) ; CAYEUX (30).—Isle of Purbeck and Weymouth, lists of Echinoderma &c. as under Jurassic, q. v. ; STRAHAN (203).—*Ech.* and *Crin.* in drift, Saxony ; SIEGERT (197).—Cuba, spp. of *Salenia*, *Cyphosoma*, *Codiopsis*, *Echinoconus*, *Discoidea* ; EGOZCUE (55).

1. Upper :

Lower Garumnian, Rivière, Landes, n. spp. of *Brissopneustes* and *Hemigymnia* ; ARNAUD (10) p. 111.

Danian :—of Scania, list of *Ech.* incl. *Holaster faxensis* n. sp. and

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Pyrina freucheni; Hennig (95).—Of Faxö, *Cidaris forchhammeri* does not occur; Schlueter (194) p. 904.

Senonian:—distribution of *Marsupites*, *Micraster coranguinum*, *Echinoconus conicus*, and *Offaster pillula* near Eastbourne; Jukes-Browne in Reid (183) pp. 7, 8.—Near Marlborough, *Marsupites*, *Pentagonaster megaloplax*, and list of *Ech.*; Meyrick (152).—White Chalk with Flints, Flamborough Head, Yorkshire, *Bourgueticrinus*?; Lamplugh (129) p. 181.—Zone of *Micraster cortestudinarium*, Cambridgeshire, *Ech.*; Reed (182) p. 152.—Road from Subiaco to Jenne, Italy *Ananchytes* cf. *ovata*; Angelis d'Ossat (9) p. 286.—Jalomitza and Dimbovitza, Roumania, list of *Ech.*; Popovici-Hatzeg (177) p. 123.—Pestera in Dobrogea, *Hemiaster*, *Cardiaster*, *Echinoconus*; Anastasiu (6).—Caucasus, *Echinocorys vulgaris*; Karakasch (103) pp. 9 & 30.—Senonian?, Algeria, *Guettaria danglesi*, n. sp.; Gauthier (76) p. 831.—Relics of former beds at Mokattam, Cairo, *Echinoconus albogalerus* and *Cidaris clavigera*; Fourtau (65) p. 100. Lower Senonian, Trümmerkalk of Scania, spp. of *Cardiaster* and *Cidaris* discussed, some new; Schlueter (194). Lower Coniacian to Upper Campanian of Dordogne and Charente Inférieur, *Cidaris pseudopistillum*; Arnaud (10) p. 109. Niobrara, lower part of *Hesperornis* beds, W. Kansas, *Uintacrinus*; Logan (133).

Turonian.—Zone of *Holaster planus*, Cambridgeshire; Reed (182) p. 145.—Chalk Rock, zone of *Heteroceras reussianum*, Cambridgeshire, *Ech.* and *Crin.*; Reed (182) p. 148.—Abu Roasch, Egypt, *Coptosoma*; Gregory (89) p. 152.—Pestera in Dobrogea, *Echinoconus subrotundus*; Anastasiu (6).—"Weissenberger Etage im Egergebiete," Bohemia, *Micraster*, *Holaster*, *Stellaster quinqueloba*; Zahálka (228) p. 76.

Cenomanian:—Cambridgeshire, Chalk Marl, *Ech.* (p. 126): Totternhoe stone, zone of *Holaster subglobosus*, *Ech.*, *Crin.* (pp. 131, 134): zone of *Rhynchonella cuvieri*, *Ech.* (pp. 139, 141): zone of *Terebratulina gracilis*, *Ech.* (p. 143); Reed (182).—Wilmington near Honiton, list of *Ech.* (pp. 244, 245) with note on spp. of *Holaster* (p. 246); Jukes-Browne (108).—Sinai, *Hemiaster*, *Holectypus*; Fourtau (69) pp. 9, 11, 13. Middle Cenomanian, Angoulême, *Galeropygus jolyi*, n. sp.; Gauthier (76) p. 836. Lower Cenomanian, N. of Trujillo, Peru, *Enallaster tschudii*, also geogr. distrib. of *Enallaster*; Douvillé (51). Seewerkalk, Piz Dartgas, Switzerland, *Cidaris*, *Holaster*; Tobler (207) p. 75.

Albian, Upper Gault of Wissant, *Cidaris gaultina*; Jukes-Browne (107).—Cambridge Greensand, *Ech.*, *Ast.*, *Crin.* (p. 111): Red Chalk of Hunstanton, *Ech.*, *Crin.* (p. 90): Gault, Cambridgeshire, *Pseudodiadema*, *Pentacr.* (p. 82); Reed (182).

2. Lower:

Aptian or Vectian, Moreseat, Aberdeen, *Ananchytes* (*?Cardiaster*), *Discoidea*, *Echinocyphus*, *Enallaster*, *Echinoconus*; Jukes-Browne (109) p. 30. Lower Greensand, Upware, Cambridgeshire, *Ech.*; Reed (182) p. 69.

Neocomian, Piz Dartgas, Switzerland, *Toxaster*; Tobler (207) p. 75.—Dealu Sasului, Roumania, *Cidaris*; Popovici-Hatzeg (177) p. 97.—Caucasus, *Pseudodiadema bourgueti*, *Holectypus macropygus*; Karakasch (103) pp. 13, 32.

c. **Jurassic**:—Isle of Purbeck and Weymouth, lists of Echinoderma and other fossils, mostly compiled, apparently without revision, from previous authors, and illustrated by quaint old woodcuts; Strahan (203).

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1. Upper:—
 Portlandian (=Tithonian); Törzburger pass, Roumania, *Ech.* and *Crin.*; SIMIONESCU (198) p. 26: of Franche-comté, E. France, list of *Ech.*; GIRARDOT (78) p. 381.
 Kimeridgian:—Kimeridge Clay, Cambridgeshire, *Cidaris*; REED (182) p. 46. Franche-comté, E. France, Virgulian (=Upper Kimeridgian), list of *Ech.* and *Crin.* (pp. 346, 347): Pterocerian (=Lower Kimeridgian), list of *Ech.* and *Crin.* (p. 335); GIRARDOT (78).
 Sequanian:—Corallian, Upware, Cambs., spp. of *Collyrites*, *Echinobrissus*, *Holectypus*, *Hyboclypus*, *Pygaster*, *Cidaris*, and *Pentacrinus*, also *Hyboclypus gibberulus* from Elsworth rock of St Ives; WEDD (216).—Coral Rag and Coralline Oolite, Upware, Cambridgeshire, *Ech.* and *Crin.* (pp. 37, 38): Ampthill Clay, Cambridgeshire, *Cidaris* and *Pentacr.* (p. 28); REED (182).—St. Clement-lès-Macon, *Hemicidaris crenularis*; LISSAJOUS (131). Astartian of Franche-comté, E. France, list of *Ech.* and *Crin.*; GIRARDOT (78) pp. 324, 325.
2. Middle:—
 Argovian,—Lower Calcareous grit, Cambridgeshire, *Ech.* and *Crin.*; REED (182) p. 23. Rauracian of Franche-comté, E. France, list of *Ech.* and *Crin.*; GIRARDOT (78) pp. 235–237.—Of Kandern in Baden, *Cidaris florigemma*; BOEHM (20) p. 680.
 Oxfordian,—Cambridgeshire, *Acrosalenia*, *Pentacr.*; REED (182) p. 14.—Of Franche-comté, E. France, list of *Ech.*, *Ast.* and *Crin.*, horizon of some considered doubtful; GIRARDOT (78) pp. 211–213. —Around Lons-le-Saunier, Jura, localities and horizons of spp. of *Cidaris*, *Pseudodiadema*, *Astropecten*, *Pentacr.*, *Balanocr.*; GIRARDOT (79) p. 626.—Of Macon, "Marnes gris-bleuâtre d'Hurigny," *Pentagonaster jurensis*, *Balanocrinus subteres*; Marnes et calcaires de Gaises, *P. jurensis*, *B. subteres*, *Pentacr. cingulatus*, *R. stockhornensis*, *Cidaris coronata*, *Rhabdocidaris caprimontana*; LISSAJOUS (130).—Of Caucasus, *Collyrites* cf. *loryi*, *C.* sp., *Holectypus* sp., *Rhabdocidaris* sp., *Cidaris* sp.: of Daghestan, *Collyrites lœwinsoni*; SPENDIAROFF (202).—*Cardioceras cordatum* beds,—S. of Windgälle, Switzerland, *Pentacr.* (pp. 69, 101): Birmenstorfer beds *Pentacr.*, *Eugeniacr.* (pp. 70, 102), *Cidaris* (pp. 73, 103); TOBLER (207).—*C. cordatum* beds, Kandern in Baden, *Millericrinus horridus*; BOEHM (20) p. 675.—Valea Lupului, Roumania, *Cidaris*, and bed of Crinoid stems; POPOVICI-HATZEG (177) p. 79.
 Callovian of Franche-comté, E. France, list of *Ech.* and *Crin.*; GIRARDOT (78) p. 137.—Around Lons-le-Saunier, Jura, localities and horizons of spp. of *Collyrites*, *Pygurus*, *Echinobrissus*, *Holectypus*, *Pygaster*, *Cidaris*, *Rhabdocidaris*, *Acrosalenia*, *Hemicidaris*, *Pseudodiadema*, *Cidaropsis*, *Stomechinus*, *Pentacrinus*, *Cyclocrinus*; GIRARDOT (79) pp. 371–625.—Caucasus, *Collyrites warwarœ*, *Holectypus* sp.; Daghestan, *Collyrites elliptica*, *C.* cf. *analis*, *C.* sp.; SPENDIAROFF (202).
3. Lower:—
 Bathonian,—Franche-comté, E. France, Cornbrash, list of *Ech.* and *Crin.* (p. 127).—Great Oolite, list of *Ech.* (pp. 87, 88); GIRARDOT (78).—Around Lons-le-Saunier, Jura, localities and horizons of spp. of *Collyrites*, *Clypeus*, *Echinobrissus*, *Galeropygus*, *Holectypus*, *Pygaster*, *Cidaris*, *Acrosalenia*, *Pseudodiadema*, *Hemicidaris*, *Pseudocidaris*, *Stomechinus*, *Pentacr.*, *Apiocr.*; GIRARDOT (79) pp. 337–570.—La Sorguette near Bandol (Var), *Pentacrinus nicoleti*, *Apiocrinus*, *Pseudodiadema pentagonum*, *Cidaris bathonica*, *C. kœchlini*, *C. babeaui*; CAZIOT (29).—Caucasus, *Collyrites rostrata*, *C. analis*, *Echinobrissus clunicularis*, *Clypeus* sp.; Daghestan, *Echinobrissus* sp.; SPENDIAROFF (202).

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Bajocian, N. of Franche-comté, E. of France, various localities and lists of fossils, *Ech.*, *Ast.* and *Crin.*, with special reference to Crinoid Limestone; KILIAN & PETITCLERC (113) passim; PETITCLERC (174) pp. 48, 55, and annotated list, pp. 124–132; detailed remarks on spp. of *Galeropygus*, *Hyboclypeus*, *Echinobrissus*, *Cidaris*, *Clypeus*, *Stomechinus*, *Hemipedina*, and *Pygaster*; LAMBERT (128).—Franche-comté, immigration and growth of Pentacrinids, their relation to coral colonies (pp. 65, 66), list of *Ech. Ast.* and *Crin.* in the district (p. 73); GIRARDOT (78).—Around Lons-le-Saunier, Jura, localities and horizons of spp. of *Cidaris*, *Rhabdocidaris*, *Stomechinus*, *Echinobrissus*, *Pentacr.*; GIRARDOT (79) pp. 190–336, 711–766.—At Château-neuf d'Entraunes (Alpes maritimes) *Eugeniacrinus*; BERTRAND (19).—Upper Bajocian near Basle, *Rhabdocidaris horrida*, *Pedina inflata*, *Cainocrinus andreæ*; GREPPIN (90) pp. 8–11.—*Humphriesianus* beds, Rotsteinthal, Switzerland, *Pentacr.*, *Cidaris* (pp. 34, 86), *Opalinus* beds, *Pentacr.* (p. 31), Engelbergthal, *Cidaris* (p. 41), Gadmerflühe, *Pentacr.* (p. 47), Krämer on Sandalp, *Cidaris*, *Pentacr.* (pp. 71, 92), Erstfelderthal, *Pentacr.*, *Cidaris* (p. 91); TOBLER (207). Brown Jura, Strunga and Coltu Tătarului, Roumania, list of *Ech.*; POPOVICI-HATZEG (177) p. 69. Inf. Oolite, Chile, *Stomechinus*; FUCINI (71) p. 2.

d. **Lias**:—Upper or Toarcian,—around Lons-le-Saunier, Jura, localities and horizons of spp. of *Pentacr.*, special notes; GIRARDOT (79) pp. 149–189, 666, 687.—Kessik-tash, W. of Angora, *Pentacr.* sp.; POMPECKJ (176) p. 727.

Middle or Liasian,—around Lons-le-Saunier, Jura, localities and horizons of spp. of *Pentacr.*, *Extracr.*, *Balanocr.*, *Rhabdocidaris*; GIRARDOT (79) pp. 123–148, 656.—Mediterranean province *Pentacrinus* fauna contrasted with that of Middle Europe; POMPECKJ (176) p. 757.—Near Rgotina, E. Servia, *Pentacr. basaltiformis* and *Cidaris*; RADOVANOVIČ (181) pp. 50, 51.—Mt. Laila, N.W. of Lentechi, Suanetia, S.W. Caucasus, *Pentacr.* columnal found by V. Sella=*P. lævisutus* q. v.; AMMON (4).—Zone of *Amaltheus margaritatus*, Kessik-tash, W. of Angora, *Pentacr. lævisutus*, and *P. goniogenos*, n. spp., the former also in Laila Mts. in Suanetia; POMPECKJ (176).

Lower or Sinemurian,—around Lons-le-Saunier, Jura, localities and horizons of spp. of *Pentacr.*, *Extracr.*, *Balanocr.*, *Cyclocr.*; GIRARDOT (79) pp. 79–122, 651.—Kandern in Baden, *Pentacrinus tuberculatus*; BOEHM (20) p. 669.

e. **Trias**:—Muschelkalk,—*Encrinus liliiformis* at Zibil in the Dobrudscha, Bulgaria; ANASTASIU (5) p. 892.

(iv) PALÆOZOIC.

a. **General**:—Vacant.

b. **Permian**:—Zechstein of Germany, *Crin.*, *Ech.*, *Oph.*, *Hol.*; SPANDEL (201).

c. **Permo-Carboniferous**:—Kama basin, Russia in Europe, *Cyathocr.*, *Palaechinus*, *Archæocidaris*; STUCKENBERG (204) pp. 167, 173, 270, 294, 354, 360. Kungur beds, Kama basin, *Cyathocrinus* cf. *ramosus*; ROMANOV (184) p. 10.

d. **Coal Measures**:—Of Ohio, *Cyathocr.* and *Zeacr.*; WHITFIELD (223) p. 596.

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Upper Coal Meas.—Kansas City, Mo., n. spp. *Crin.*; Butts(25).—Kansas, *Hydreionocrinus kansasensis*, n. sp.; Weller (217).

Missourian series, Bethany Limestone, Bethany, Mo., and Grand R., near Decatur, Ia., *Eupachycrinus verrucosus* (pp. 273, 278): Earlham Limestone, near Davis city, Decatur Co., Ia., *Archæocidaris* and *Zeacrinus* (p. 280); Bain (11).

e. **Lower Carboniferous**:—Calderwood Limestones near East Kilbride, crinoid columnals (p. 64) and *Archæocidaris* (p. 77); Neilson (159).—Near Berwick on Tweed, *Archæocidaris*, *Poteriocrinus*; Gunn (92) p. 30.—Lower Brown Limestone at Eyarth near Ruthin, N. Wales, *Archæocidaris urei*; Morton (158) p. 319.

Horizon *V1a* of Pair, Belgium, *Actinocrinus tenuis*, *Platycrinus arenosus*; Destinez (47) p. xxxvi.

Base of Viséen, black marble of Denée, *Archæocidaris* n. sp., *Palechinus* 2 n. spp., and *Scaphiocrinus* sp.; Soreil (200) p. lxxix; also "un bel oursin dans les marbres noirs des bords de la Meuse au Sud de Houx;" Dorlodot in Soreil (200) p. lxxxiii.

Kama basin, Russia in Europe, *Cyathocr.*, *Poteriocr.*, *Archæocidaris*, *Palaechinus paradoxus*; Stuckenberg (204) pp. 156, 231, 343.

Maxville Limestone (=Chester Group) Ohio, *Cyathocr.* [?], *Pentremites*; Whitfield (223) p. 577.

Osage crinoid fauna of central N. America, compared with that of W. Europe, and with the Waverly fauna of N. America; Weller (218) pp. 308–312.

f. **Devonian**:—Upper,—Psammites du Condroz, Belgium, *Dinocystis barroisi* n. g. et sp.; Bather (16 A) p. 543.

Middle:—Lenneschiefer, Rhine provinces, *Crin.*; Winterfeld (226) pp. 4, 11, 12, 23, 29.—Hamilton Group, Ohio, list of spp. from below and above bone-bed, *Crin.*; Whitfield (223) pp. 539, 544, 553.—Charlestown, Ind., *Dolatocr. depressus*; Miller in Greene (88).—Ontario, revised list of *Crin.*, *Ast.*, *Blast.*, with n. spp. of *Dolatocrinus* and *Gennæocrinus*; Whiteaves (222) pp. 368–376.—Cedar Valley Limestone, at Littleton on R. Wapsipinicon, Buchanan Co., Ia., *Megistocrinus farnsworthi*; Calvin (27) p. 232.

Milwaukee, Wis., n. spp. of *Melocr.* and *Pentremitidea*; Weller (219).—Rio Maecurú, Amazons, *Ctenocrinus* (?) columnals (p. 6); Ereré, stem-fragments (p. 15); Katzer (110).

g. **Silurian**:—Gotland, reef-building *Crin.*; Wiman (225) pp. 319, 322 & 323.—*Crin.* in Drift, Saxony; Siegert (197).—Black limestone of Podol, E. Bohemia, *Lobolithus*; Jahn (105) pp. 217–220.—Valley of R. Galbe, Camelas, and Castelnou, E. Pyrenees, *Scyphocr. elegans*; Roussel (186) pp. 282, 284.

Comparison of Crinoid fauna of central N. America with that of W. Europe, and contrast with N. York fauna, presence of *Crotalocrinus*, *Corymbocrinus*, *Pycnosaccus*, *Petalocrinus*, in Mississippian region and N.W. Europe; Weller (220) pp. 700–702.—Distribution of spp. of *Petalocrinus* in Iowa and Gotland, with evidence as to homotaxy of beds; Bather (16) p. 402.

Crinoidal limestones of Clinton and Niagara age in Ohio and Indiana, with localities of *Pisocr. gemmiformis* and *Stephanocr. osgoodensis*, *Palæaster*, and *Agelacrinus*; Foerste (62) pp. 169, 170, 171, 173, 177, 183, 184, 185, 186, 195, 197, 198, 199.—Niagara Limestone, Delaware Co., Ia. *Caryocrinus ornatus*, *Eucalyptocrinus crassus*; Calvin (26) pp. 149, 157.

h. **Ordovician**:—Étage 5, Upper *Chasmops* beds near Kristiania, *Echinosphæra* (p. 34), *Meristella crassa* beds in Ringerike, *Sphæronis* and *Caryocrinus* (p. 17); Kiaer (112).

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Assise de Gembloux, at Fauquez-Ittre, Belgium, *Sphæronis munitus*, *S. punctatus*; MALAISE (144) p. lxxvi.

Caradoc, between Arville and Wierde, at Fosse, and at Vitrival, (Sambre-et-Meuse), *Glyptocrinus basalis*, *Echinosphæra baltica*, *Sphæronis stelluliferus*; MALAISE (145) p. 258.—*Cyst.* in drift, Saxony; SIEGERT (197).—Valley of R. Galbe, E. Pyrenees, *Echinosphæra*; ROUSSEL (186), p. 282.

Trenton Limestone, near Montreal, *Glyptocystis logani*, *Heterocrinus tenuis*; AMI (3) p. 48.

Chazy Limestone, near Montreal, *Bolboporites americanus*, *Malocystis murchisoni*, *Blastoidocrinus carchariædens*; AMI (3) p. 48.

IV. SYSTEMATIC†.

(A.)—ECHINODERMA IN GENERAL.

Vacant.

(B.)—HOLOTHURIOIDEA.

Acanthotrochus, incl. 1 sp., *mirabilis*; ÖSTERGREN (167) p. 119.

Anaperus peruanus Trosch., is a *Thyone*, and distinct from *Holothuria peruviana* Lesson; LUDWIG (138) p. 439.

Anapta, referred to *Synaptinæ*, with spp. *A. fallax* and *A. gracilis*, but *A. subtilis* Sluiter is only a regenerating individual; ÖSTERGREN (167) p. 117. *A. fallax*; LUDWIG (137) p. 70: colour in life; LUDWIG (138) p. 445.

Ankyroderma danielsseni; LUDWIG (137) p. 65. *A. loricatum*, probably intended as **n. sp.**, 1090–2425 metres, locality not stated; and *A. maroccanum*, **n. sp.**, depth and locality not stated; PERRIER (172) C.R. Ac. Sci. cxxvi, p. 1666.

†*Annulina quinquelobata* Terquem as Foraminifer, is spicule of Chirodote holothurian; SPANDEL (201) p. 42.

Auricularia coarctata, **n. sp.**, coast of Brazil and ? Sargasso sea; (156) p. 22, pl. i, and (157) p. 18, pl. i; *A. minor*, **n. sp.**, near Fernando Noronha; (156) p. 26, pl. i, and (157) p. 21, pl. ii; *A. nudibranchiata*, probably an Elasipod; (156) p. 28, and (157) p. 22; *A. paradoxa*, **n. sp.**, S. Equatorial current; (156) p. 26, pl. i, and (157) p. 21, pl. i; *A. plicata*, **n. sp.**, Bermudas; (156) p. 27, pl. ii, and (157) p. 22, pl. ii; *A. simplex*, **n. sp.**, Bermudas; (156) p. 16, pl. i, and (157) p. 14, pl. i; *A. sphærigera*, **n. sp.**, = "Auricularia mit Kugeln" of Müller *pars*, Trieste; (156) p. 23, and (157) p. 19; *A. stelligera*, **n. sp.**, "Auricularia mit Kugeln" of Müller *pars*, Marseilles and Nice; (156) p. 24, text-fig. 1, and (157) p. 19, text-fig. 1: MORTENSEN.

Bathyplotes moseleyi; LUDWIG (137) p. 8.

Benthothuria, **n. g.**, genotype *B. funebris*, **n. sp.**, 782–1230 metres, locality not stated; PERRIER (172) C.R. Ac. Sci. cxxvi, p. 1665.

† A dagger prefixed to the trivial name of a species indicates that it is fossil; prefixed to the name of the author, it denotes that the reference is to the species in a fossil state; prefixed to the name of a genus, it indicates that all species of the genus here recorded are fossil, and the † is therefore not repeated before each name. The abbreviations *l. c.* and *op. cit.* refer only to the place or work quoted *immediately before*.

A name and reference quoted without further statement (*e.g. Ankyroderma danielsseni*; LUDWIG, *supra*) indicate that the quoted author's statement refers merely to locality or some question of slight importance. Further information can usually be gleaned from the cross-references under TITLES.

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Caudina coriacea, note on spicules; LUDWIG (137) p. 63: anal papillæ, radiating muscles, circumanal ampullæ, mode of life; DENDY (45): thrown up by storm; DENDY (46) p. 323.

Chiridota restricted to 17 spp., for others see *Sigmodota*; ÖSTERGREN (167) p. 118. *C. contorta*, distrib., spicules, gonads, diœcious, protection of brood in ovaries, young described; LUDWIG (137) p. 73, pl. iii. †*C. costifera*; SPANDEL (201) p. 43. *C. dunedinensis*, referred to *Trochodota*; LUDWIG (137) p. 87. *C. fernandensis*, **n. sp.**, Juan Fernandez; LUDWIG (138) Zool. Jahrb., Suppl. 4, Fauna Chilensis, Heft ii, p. 446. †*C. florida*; SPANDEL (201) p. 43. †*C. geinitziana*, **n. sp.**, Zechstein of Galgenberg, W. of Ranis in Thuringia; SPANDEL (201) Abh. Ges. Nurnberg, xi, p. 28, pl. xiii: LAMBERT in Review corrects [!] this to *geinitzi*. *C. pisanii*, spicules, gonads, and other notes, incl. *C. purpurea* Theel *non* Lesson; LUDWIG (137) p. 71: colour in life, with internal parasite, probably *Entocolax*; LUDWIG (138) p. 445. *C. purpurea* discussed; LUDWIG (137) p. 67. *C. purpurea* Lesson, see *Trochodota*.

Chiridotinæ, sub-fam. of *Synaptidæ*, incl. *Sigmodota* and *Chiridota*; ÖSTERGREN (167) p. 117.

Chondroclœa, **n. g.** of *Synaptinæ*, no genotype, but spp. in two sections: A. *indivisa*, *kallipeplos*, *keferstein*i, *lactea*, *nigra*, *orsinii*, *psara*, *recta*, *reticulata*, *striata*, *tenuis*, *vivipara*, B. *beselii*; ÖSTERGREN (167) Ofv. Ak. Forh. lv, p. 113.

Cladolabes viridimana Phil., 1860, original description reprinted = *Phyllophorus chilensis* Semper and *Eucyclus duplicatus* Lampert; LUDWIG (140).

Colochirus armatus, course of gut; ÖSTERGREN (165) p. 103. *C. brevidentis* Hutton, from Juan Fernandez, incl. *C. calcareus* Dendy, redescr., spicules figd.; LUDWIG (138) p. 442, pl. xxvi. *C. montagui*; GADEAU DE KERVILLE (74) p. 340. *C. ocnoides*, thrown up in millions by storm; DENDY (46) p. 323: is a *Cucumaria*, perhaps also are *C. calcareus* and *C. brevidentis*; LUDWIG (137) p. 30. *C. quadrangularis*, course of gut; ÖSTERGREN (165) p. 103. *C. robustus*, **n. sp.**, Strait of Korea (p. 134), course of gut (p. 103); ÖSTERGREN (165) Zool. Anz. xxi.

Cucumaria abyssorum; LUDWIG (137) p. 39: variations from Lampert's description; ÖSTERGREN (165) p. 104, footnote. *C. alba*, divergencies from Dendy's account, not a *Colochirus*; LUDWIG (137) p. 29. *C.* (*Semperia*) *bermudiensis*, validity questioned; CLARK (34) pp. 411, 413. *C. chiloensis*; LUDWIG (137) p. 38. *C. crocea*, additions to previous description, esp. genital organs ♀, and young; LUDWIG (137) p. 15, pl. i. *C. frondosa*, Cuvierian organs not to be found; ÖSTERGREN (165) p. 108. *C. godeffroyi*, distinct from *C. crocea*, redescr., spicules figd., colour in life; LUDWIG (138) p. 435, pl. xxvi. *C. georgiana* incl. *C. pithacnion*; LUDWIG (137) p. 38. *C. huttoni*, peculiar distrib. of podia, and other notes; LUDWIG (137) p. 39. *C.* (olim *Siphothuria*) *incurvata* (E. Perrier), short diagnosis; PERRIER (172) p. 1666. *C. koreensis*, **n. sp.**, Strait of Korea; ÖSTERGREN (165) Zool. Anz. xxi, p. 109. *C. lævigata*, incl. *C. serrata* cum varr., changes in growth of spicules, colour in life, distribution and habitat, additions to Lampert's description of young; LUDWIG (137) p. 32. *C. leonina*, colour in life; LUDWIG (138) p. 434: incl. *C. dubiosa* *C. salmini*, *C. mendax*, and *Ocnus vicarius*, distrib., notes on spicules; LUDWIG (137) p. 36. *C. longicauda*, **n. sp.**, Japan or China (p. 108, text-fig.), course of gut (p. 105), respiratory trees (p. 108); ÖSTERGREN (165) Zool Anz. xxi. *C. ocnoides*; LUDWIG (137) p. 30. *C. parva*, protection of brood, young described and figd.; LUDWIG (137) p. 25, pl. i. *C. planci*, *Auricularia*; MORTENSEN (156), p. 29, and

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(157) p. 23. *C. punctata*, Bermuda, some variations from type; CLARK (34) pp. 411, 413. *C. squamata*, **n. sp.**, Betsy Cove, Kerguelen Id., spicules figd.; LUDWIG (137) Hamburg. Magalhaens. Sammelreise, p. 27, pl. i. *C. steineni*, **n. sp.**, S. Georgia and Port Stanley = *Thyone muricata* Lampert *non* Studer, spicules figd.; LUDWIG (137) *op. cit.* p. 30, pl. ii.

Deima atlanticum, **n. sp.**, 4360 metres, 38° 54′ N., 23° 27′ W.; HEROUARD (100) text-figg. 1 & 2.

Euapta, **n. g.** of *Synaptinæ*, no genotype, but spp. in two sections: A. *godeffroyi*, *lappa*, *polii*, B. *glabra*, *grisea*, *serpentina*; ÖSTERGREN (167) Ofv. Ak. Forh. lv, p. 112.

Eucyclus duplicatus Lampert, syn. of *Phyllophorus chilensis* Semper; LUDWIG (138) p. 439.

†*Hemisphæranthos costifer* et *floridus* Terq. referred to *Chirodota*; SPANDEL (201) p. 43.

Herpysidia, **n. g.**, genotype *H.* (olim *Stichopus*) *tizardi* Théel: and *H. reptans*, **n. sp.**, 2115 metres, locality not stated; PERRIER (172) C.R. Ac. Sci. cxxvi, p. 1665.

Holothuria abbreviata, probably abnormal *H. captiva*; CLARK (34) p. 413. *H. floridana*; *l. c.* *H. forskali*, genital lacuna, dorsal mesentery and rete intestinalis; RUSSO (189). *H. impatiens*, respiratory trees; BORDAS (21): growth-change in spicules, the young being *H. aphanes*; ÖSTERGREN (166). *H. intestinalis* referred to *Mesothuria*; PERRIER (172) p. 1665. *H. lactea*, Théel, see *Zygothuria*. *H. limbata*, **n. sp.**, 564 metres, locality not stated; PERRIER (172) C.R. Ac. Sci. cxxvi, p. 1665. *H. lubrica* Sel., incl. *H. parva*, *H. erinaceus*, *H. glaberrima*, variations in number of Polian vesicles, stone-canals, and Cuvierian organs, also in shape of spicules; LUDWIG (138) p. 434. *H. murrayi* referred to *Mesothuria*; PERRIER (172) p. 1665. *H. platei*, **n. sp.**, coast of Juan Fernandez; LUDWIG (138) Zool. Jahrb., Suppl. 4, Fauna Chilensis, Heft ii, p. 432, pl. xxvi. *H. poli*, respiratory trees; BORDAS (21): see under II, B, i, b, 7; RUSSO (188): genital lacuna; RUSSO (189). *H. poli* of Russo's previous papers is *H. forskali*, while *H. stellati* of Russo's previous papers is *H. poli*; RUSSO (189) p. 115. *H. surinamensis* ?, Bermuda; CLARK (34) p. 413. *H. tubulosa*, respiratory trees; BORDAS (21): unripe ovum and response to spermatozoon; IWANZOFF (104): dissection: KÜKENTHAL (123) p. 125: genital lacuna, dorsal mesentery and rete intestinalis; RUSSO (189): *Auricularia*, redescr.; MORTENSEN (156) p. 17, and (157) p. 14. *H. verrilli* referred to *Mesothuria*; PERRIER (172) p. 1665.

Hypsilothuria [olim et melius *Ypsilothuria*] *attenuata* E. Perrier = *Sphærothuria bitentaculata* Ludwig, 2325 metres: *H. talismani*, 1123 metres; PERRIER (172) p. 1666.

Kolga hyalina, coil of gut not abnormal; ÖSTERGREN (165) p. 102.

Labidoplax, **n. g.** of *Synaptinæ*, no genotype, but spp. in two sections: A. *tenera*, B. *digitata*, *dubia*, *incerta*, *thomsoni*; ÖSTERGREN (167) Ofv. Ak. Forh. lv, p. 115.

Mesothuria intestinalis; PERRIER (172) p. 1665. *M. magellani*; LUDWIG (137) p. 8. *M. maroccana*, **n. sp.**, 2200 metres, locality not stated; PERRIER (172) C.R. Ac. Sci. cxxvi, p. 1665. *M. murrayi*; PERRIER (172) p. 1665. *M. thomsoni*; LUDWIG (137) p. 9. *M. verrilli*; PERRIER (172) p. 1665.

Myriotrochinæ, sub-fam. of *Synaptidæ*, incl. *Myriotrochus*, *Trochoderma*, *Acanthotrochus*; ÖSTERGREN (167) p. 119.

Myriotrochus, incl. 2 spp., *rinki* and *vitreus*; ÖSTERGREN (167) p. 119. *M. rinki*, coil of gut not abnormal; ÖSTERGREN (165) p. 102.

Ocnus compressus, **n. sp.**, 627 metres, locality not stated; PERRIER (172) C.R. Ac. Sci. cxxvi, p. 1666.

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Orcula, syn. of *Phyllophorus*; ÖSTERGREN (165) p. 103, footnote.

Pœlopatides grisea, **n. sp.**, 1918–4060 metres, locality not stated; PERRIER (172) C.R. Ac. Sci, CXXVI, p. 1665.

Phyllophorus chilensis has 20 tentacles, incl. *Eucyclus duplicatus* Lamp., colour in life and in spirit, its food, protection by stones; LUDWIG (138) p. 439: syn. of *P. viridimana* Phil. sp.; LUDWIG (140). *P. drummondi*; LÖNNBERG (134) p. 46. *P. longidentis*; LUDWIG (137) p. 49. *P. mollis*, red in life, variation in size of tentacles, probably = *Holothuria peruviana* Lesson; LUDWIG (138) p. 437. *P. pellucidus*, colour, protection by zostera leaves; LÖNNBERG (134) p. 46.

†*Prosynapta*, **n. g.** based on anchors; SPANDEL (201) Abh. Ges. Nurnberg, xi, p. 41: preocc. Cuénot et alii pro genere ficto, apud LAMBERT in Review. *P. eiseliana*, **n. sp.**, Zechstein of Galgenberg, W. of Ranis in Thuringia; SPANDEL (201) p. 44, pl. xiii.

Protankyra, **n. g.** of *Synaptinæ*, no genotype, but incl. *abyssicola, aculeata, asymmetrica, autopista, bankensis, benedeni, bidentata, brychia, challengeri, distincta, innominata, insolens, ludwigii, molesta, petersi, pseudo-digitata, rodea, similis, uncinata, verrilli*; ÖSTERGREN (167) Ofv. Ak. Forh. lv, p. 116.

Pseudocucumis mixta, **n. sp.**, West Norway, probably Molde (p. 135, text-fig.), position of respiratory trees (p. 105); ÖSTERGREN (165) Zool. Anz. xxi.

Pseudopsolus, **n. g.**, based on *Psolus macquariensis* Dendy, redescribed, ♀; LUDWIG (137) Hamburg. Magalhaens. Sammelreise, p. 49.

Pseudostichopus atlanticus, **n. sp.**, 4165 metres, locality not stated; PERRIER (172) C.R. Ac. Sci. CXXVI, p. 1665. *P. mollis* (p. 7), *P. villosus* (p. 8); LUDWIG (137).

Psolidium dorsipes; LUDWIG (137) p. 51.

Psolus, course of gut; ÖSTERGREN (165), p. 103. *P. antarcticus*, distrib., protection of brood on sole, description of young; LUDWIG (137) p. 53, pl. iii. *P. ephippifer*; LUDWIG (137), p. 51. *P. japonicus*, **n. sp.**, Japan, Strait of Tsugar; ÖSTERGREN (165) Zool. Anz. xxi, p. 135. *P. phantapus*; LÖNNBERG (134) p. 47: *Auricularia* [sic, but it is a Pupa, "Auricularia-Stadium unbekannt"]; MORTENSEN (156) p. 30, pl. i, and (157) p. 23, pl. i.

Sigmodota, referred to *Chiridotinæ*, incl. *Toxodora ferruginea*, and *T. japonica*, *Trochodota dunedinensis*, *T. studeri*, and *T. venusta*, *S. australiana*, and *S. contorta*; ÖSTERGREN (167) p. 117. *S. purpurea* Studer, syn. of *Chiridota contorta*; LUDWIG (137) p. 82.

Siphothuria incurvata, vide *Cucumaria*.

Sphærothuria bitentaculata in Indian Ocean, perhaps = *Ypsilothuria* from Atlantic; KOEHLER (119). See *Hypsilothuria*.

Stichopus diaboli; CLARK (34) p. 413. *S. fuscus*, spicules first figd.; LUDWIG (137), p. 5, pl. i. *S. haytiensis*, perhaps syn. of *S. mœbii*; CLARK (34) p. 413. *S. japonicus*, spicules of young resemble those of old *S. regalis*; ÖSTERGREN (165) p. 134 footnote. *S. mœbii*, includes *S. xanthomela*; CLARK (34) p. 143. *S. mollis*, incl. *Holothuria robsoni* Hutton, and ? *S. fuscus*; LUDWIG (137) p. 7. *S. regalis*, respiratory trees; BORDAS (21). *S. tizardi*, vide *Herpysidia*. *S. xanthomela*, v. *S. mœbii*. *S.* sp. shelters a fish; COUTIÈRE (38) p. 240.

Synallactes challengeri; LUDWIG (137) p. 8. *S. crucifera*, probably intended as **n. sp.**, 2115 metres, locality not stated; PERRIER (172) p. 1665.

Synallactinæ, intermediate in bathymetric distrib. and evolution between Holothuriinæ and Elasipoda; PERRIER (172) p. 1664.

Synapta, restricted to 7 spp.: *albicans, gracilis, inhærens, macrankyra, ooplax, pourtalesii, roseola*: others referred to genera *Euapta, Chondroclæa, Labidoplax, Protankyra, Anapta*, qq. v.; ÖSTERGREN (167)

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p. 114. *S. digitata*, *Auricularia*, redescr. and distinguished from other "Auricularien mit Kalkrädchen," wheels figd.; MORTENSEN (156) p. 18, and (157) p. 15, text-fig. 5. *S. girardi*; DAVENPORT (42) p. 686 [v. *S. inhærens*]. *S. grisea*, 1 m. 50 long; COUTIÈRE (37) p. 155. *S. hispida* Heller, is a young *S. thomsoni*; LUDWIG (135) p. 8. *S. inhærens* (=*girardi*), breeding season; BUMPUS (24) p. 856. *S. macrankyra*, **n. sp.**, Naples; LUDWIG (135) Zool. Anz. xxi, p. 2. *S. picta*, see *S. vivipara*. *S. roseola*; DAVENPORT (42) p. 686. *S. vivipara*; CLARK (34) p. 413: GEROULD (77): Oersted, olim *Synaptula*, incl. *S. picta* Théel, distribution, habitat, habits, breeding, detailed account of development, general anatomy, and sense-organs; CLARK (32).

Synaptinæ, sub. fam. of *Synaptidæ*, incl. *Euapta*, *Chondroclæa*, *Synapta*, *Labidoplax*, *Protankyra*, *Anapta*; ÖSTERGREN (167) p. 111.

Synaptula, see *Synapta vivipara*.

Tesselatæ, family including *Ypsilothuria*; PERRIER (172) p. 1666.

Theelia (? *Psolidium*) *disciformis* (? *Psolidium*) *incerta*, and *T. porifera*; LUDWIG (137) p. 51.

Thyone anomala, **n. sp.**, Strait of Formosa (p. 110), course of gut (p. 105), position of mesentery (p. 106); ÖSTERGREN (165) Zool. Anz. xxi. *T. briareus*, breeding season; BUMPUS (24) p. 856. *T. gadeana*, **n. sp.**, 106 metres, locality not stated; PERRIER (172) C.R. Ac. Sci. cxxvi, p. 1666. *T. lechleri*, not a *Thyonidium*, spicules descr. and figd., calcareous ring, and other notes, incl. *T. hassleri*; LUDWIG (137) p. 44, pls. ii & iii. *T. muricata*, redescriptions of type, see also *Cucumaria steineni*; LUDWIG (137) p. 41. *T. polybranchia*, **n. sp.**, China Sea (p. 133), respiratory trees (p. 107); *T. serrifera*, **n. sp.**, Norway, Trondhjemsfjord (p. 133, text-fig.), position of respiratory trees (pp. 106 & 107): ÖSTERGREN (165) Zool. Anz. xxi. *T. spectabilis*, incl. *T. meridionalis* and *cunninghami* of Bell, but specimen from Port Phillip is *T. okeni*; LUDWIG (137) p. 42.

Toxodora, vide *Sigmodota*.

Trochoderma, incl. 1 sp., *elegans*; ÖSTERGREN (167) p. 119.

Trochodota, vide *Sigmodota*. *T. dunedinensis*; LUDWIG (137) p. 87. *T. purpurea*; LUDWIG (138) p. 448: distrib., spicules, incl. *Chirodota australiana* and *C. studeri*; LUDWIG (137) p. 83, pl. 3.

Trochostoma antarcticum; LUDWIG (137) p. 65. *T. thomsoni*, coil of gut not abnormal; ÖSTERGREN (165) p. 102. *T. violaceum*; LUDWIG (137) p. 64.

Ypsilothuria, vide *Hypsilothuria* and *Sphærothuria*.

Zygothuria, **n. g.** genotype *Z. lactea* (Théel, olim *Holothuria*); and *Z. connectens*, **n. sp.**, 1975–2518 metres, locality not stated; PERRIER (172), C.R. Ac. Sci. cxxvi, p. 1665.

(C).—ECHINOIDEA.

General account, division into *Palechinoidea* and *Euechinoidea* retained; LAHUSEN (127) p. 162.

†*Acrosalenia*:—*A.* cf. *hemicidaroides* (pp. 345, 514), *A. lamarcki*, var. (pp. 576, 591), *A.* cf. *lycetti* (p. 345), *A.* n. sp. aff. *marioni* (pp. 576, 591), *A. spinosa* (pp. 345, 377, 415, 485, 509, 514, 591); GIRARDOT (79).

Aerope fulva, **n. sp.**, 1175–1772 fms., various stations in G. of Panama; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 81, pl. viii.

†*Agassizia*:—*A. nicaisii*, **n. sp.** (p. 64, pl. A xxiv), *A. tissoti*, **n. sp.** (p. 65, pl. A xxiv): Nummulitic Limestone, Algeria; POMEL (175).

†*Amblypygus melitensis*, vide *Pseudohaimea*.

†*Amphidetus mediterraneus*; POMEL (175).

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†*Amphiope*:—*A. depressa*, **n. sp.**, Helvetian (p. 284, pls. B xii, xiv), *A. palpebrata*, **n. sp.**, Cartennian (p. 281, pl. B xi), *A. personata*, **n. sp.**, Cartennian (p. 285, pl. B xi bis), *A. villei*, **n. sp.**, Cartennian (p. 282, pl. B xi bis): Algeria; POMEL (175).

†*Ananchytes* [melius *Ananchites*]:—*A. ovata*; SIEGERT (197) p. 96. *A.* cf. *ovata*; ANGELIS D'OSSAT (9) p. 286. "*A. subglobosus* Lmk." Desor, what can it be? perhaps *A. sulcatus*; SCHLUETER (194) p. 899. *A. sulcata*; SIEGERT (197) p. 96. See also *Echinocorys*.

†*Anapesus*:—*A.*? *afer*, **n. sp.**, Pliocene (p. 306, pl. C iii), *A. angulosus*, **n. sp.**, Pliocene (p. 305, pl. C vi), *A. interruptus*, **n. sp.**, Helvetian (p. 300, pls. C v, xiii), *A. maurus*, **n. sp.**, Sahelian (p. 302, pl. C vii), *A. saheliensis*, **n. sp.**, Sahelian (p. 301, pl. C iii), *A. serialis*, **n. sp.**, Pliocene (p. 303, pl. C iv), *A. tuberculatus*, **n. sp.**, Helvetian (p. 298, pls. C v, xiii): Algeria; POMEL (175).

†*Anizaster gibberulus*; FOURTAU (66) p. 84.

Arbacia, development under acid and alkali; LOEB (132). †*A. massylea*, **n. sp.**, Cartennian, Algeria; POMEL (175) p. 316, pl. C xiv. *A. punctulata*; DAVENPORT (42) p. 686: 4-rayed as concerns ambulacra, but 5-rayed gonads; OSBORN (164): breeding season; BUMPUS (24) p. 855: *Echinopluteus*, redescr.; MORTENSEN (156) p. 123, and (157) p. 87. *A. pustulosa*; KOEHLER (117) p. 9: PALLARY (168): bastard larva; DRIESCH (54): *Echinopluteus*, redescr.; MORTENSEN (156) p. 119, text-fig. 11, and (157) p. 84, text-fig. 11.

†*Arbacina asperata*, **n. sp.**, Sahelian (p. 314, pl. C x), †*A. badinskii*, **n. sp.**, Helvetian or Sahelian (p. 314, pl. C xi), †*A. nicaisii*, **n. sp.**, Pliocene (p. 312, pl. C xi): Algeria; POMEL (175). The genus maintained, with first living representative, *A. pallaryi*, **n. sp.**, G. of Oran, Algeria; GAUTHIER (76) Bull. Soc. geol. France (3), xxv, p. 840, pl. xxiv; see also PALLARY (168). †*A. saheliensis*, **n. sp.**, Sahelian (p. 313, pl. C xi), †*A. welschii*, **n. sp.**, Helvetian (p. 315): Algeria; POMEL (175).

†*Archæocidaris*:—*A. urei*, with plates and spines in position; NEILSON (159) p. 77 and fig. 3. *A.* **n. sp.** sine nom.; SOREIL (200) p. lxxix. *A.* sp.; BAIN (11) p. 275, 280 & 281. *A.* sp., Carboniferous and Permo-Carboniferous, Artinsk beds, Kama basin, Russia; STUCKENBERG (204) p. 231, 271, 343, 354, pl. v, f. 22 a, b.

†*Asterostoma*:—*A. cubense* (p. 67, pl. xxi), *A. excentricum* (p. 65, pl. xx), *A. jimenoi* (p. 69, pl. xxii): Cuba; EGOZCUE (55).

Asthenosoma hystrix, well-developed Stewart's organs; KOEHLER (117) p. 9.

†*Astrodapsis*:—*A. tumidus* and *A. whitneyi*; MERRIAM (151).

†*Breynia cubensis*, Cuba; EGOZCUE (55) p. 87, pl. xxv.

Brissaster, subgenus of *Schizaster*, discussed; POMEL (175) p. 69.

†*Brissoma* Ag. discussed and maintained (p. 41), *B. latipetalum* (also as *Brissopsis*), **n. sp.**, Sahelian (p. 45, pl. A vi), *B. milianense* (also as *Brissopsis*), **n. sp.**, Cartennian (p. 43, pl. A viii), *B. rocardi* (also as *Brissopsis ovatus*), **n. sp.**, Sahelian (p. 46, pl. A v), *B. saheliense* (also as *Brissopsis*), **n. sp.**, Sahelian (p. 44, pl. A v), *B. speciosum* (also as *Toxobrissus*), **n. sp.**, Sahelian (p. 47, pl. A viii), *B. tuberculatum* (also as *Brissopsis*), **n. sp.**, Pliocene (p. 48, pl. A vi): Algeria; POMEL (175).

†*Brissomorpha welschii*, **n. sp.**, Helvetian, Algeria; POMEL (175) p. 27, pl. A xxi & xxii.

†*Brissopatagus*:—*B. beyrichi* referred to *Euspatangus*, & *B. caumonti* discussed, (p. 154), *B. damesi*, **n. sp.**, Middle Eocene, N. of S. Floriano in Valpolicella, Venetia, "*Pericosmus*-ähnlich Spatangid mit den Stachelwarzen der echten Spatangen" (p. 152, pl. iii); OPPENHEIM (163) Zeitschr. Deutsch. geol. Ges. l.

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†*Brissopneustes aturensis*, **n. sp.**, Garumnian of Landes; ARNAUD (10) Act. Soc. Bordeaux, liii, p. 111, pl. ii. LAMBERT in Review says this is not *Brissopneustes* but "un *Micraster* à trois pores génitaux."

†*Brissopsis boutyi*, **n. sp.**, Helvetian, Algeria; POMEL (175) p. 53, pl. A xxiv. *B. columbaris*, **n. sp.**, 511–1793 fms., various stations in G. of Panama; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 82. †*B. delagei*, **n. sp.**, Cartennian (p. 56, pl. A xxiv), †*B. depressa* (also as *Toxobrissus*), **n. sp.**, Sahelian (p. 52, pls. A vi & viii), †*B. incerta*, **n. sp.**, Sahelian (p. 58, pl. A xxiv): Algeria; POMEL (175). †*B. jimenoi*, Cuba; EGOZCUE (55) p. 79, pl. xxiv. †*B. lata* (also as *Toxobrissus*), **n. sp.**, Sahelian, Algeria; POMEL (175) p. 50, pl. A vii. *B. lyrifera*; KOEHLER (117) p. 24. †*B. nicaisii*, **n. sp.**, based on *Eupatagus elongatus* Nic. non Agass., Helvetian (p. 54, pl. A xxiv), †*B. oranensis* (also as *Toxobrissus*), **n. sp.**, Sahelian (p. 57, pls. A vii & xxiv): Algeria; POMEL (175). †*B. ottnangensis*; SCHAFFER (193) p. 535. †*B. pasqualii*, **n. sp.**, Londinian, I, b, Ramaga near Edfu, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 52, pl. v. †*B. pouyannei* (also as *Toxobrissus oblongus*), **n. sp.**, Sahelian (p. 51, pls. A vi & vii), †*B. tissoti*, **n. sp.**, Helvetian (p. 55, pl. A xxiv): Algeria; POMEL (175).

†*Brissus columbaris*, Cuba; EGOZCUE (55) p. 77, pl. xxvi. †*B. gouini*, **n. sp.**, Pliocene, Algeria; POMEL (175) p. 39, pl. A xxiii. *B. unicolor*; CLARK (34) p. 413; CLARK (35); PALLARY (168).

Bunactis, section of *Clypeaster*; POMEL (175) p. 204.

†*Caratomus londinianus*, **n. sp.**, Londinian, II, c, near Siut, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 50, pl. iv.

†*Cardiaster*:—*C.* ? *ignabergensis*, **n. sp.**, Lower Senonian, Trümmerkalk, Ignaberga, Scania, recorded by Lundgren as *Hemipneustes*, sp. (p. 896, pl. xxxii), *C. jugatus*, compared with Scanian, supposed *Cardiaster*, spp. (p. 894, pl. xxxiii), *C.* ? *scaniæ*, **n. sp.**, Senonian, "Feuerstein" in drift, Scania, formerly referred to *C. jugatus* (p. 896, pl. xxxii); SCHLUETER (194) Zeitschr. Deutsch. geol. Ges. xlix.

†*Cassidulus australiæ*; TATE (205) p. 411.

Centrostephanus longispinus, response to shadow; UEXKÜLL (209).

†*Cidaris australiæ* Duncan is a *Stereocidaris*, but the fossil usually listed under this name is *Goniocidaris*, sp.; TATE (205) p. 411. †*C.* (*Plegiocidaris*) *avenionensis*; POMEL (175) p. 321, pl. C ii. †*C. bathonica* (pp. 345, 485, 514, 576, 591), †*C. calloviensis* (pp. 563, 576, 591, 597); GIRARDOT (79). †*C. clavigera*, spines in surface drift at Mokattam; FOURTAU (65) p. 100. †*C. courtaudiana*; PETITCLERC (173) p. 125. †*C. desmoulinsi*; POMEL (175) p. 321, pl. C ii. †*C. desori*, var. *helvetica* [? **var. nov.**], for Bajocian specimens; LAMBERT (128) p. 151, and PETITCLERC (173) p. 126. †*C.* **n. sp.**, *aff ducreti*; GIRARDOT (79) p. 631. †*C. florigemma*; WEDD (216) pp. 602, 604, 607. †*C. forchhammeri* does not occur in Faxö, only in French pisolitic limestone; SCHLUETER (194) p. 904: is syn. of *C. tombecki* and does not occur in Danian of Scandinavia, but has been confused with *Temnocidaris danica*; HENNIG (95) p. 1. †*C.* cf. *guerangeri* (pp. 576, 591), †*C. koechlini* (pp. 345, 377, 401, 711, 742, 766), †*C. læviuscula* (pp. 576, 613, 620); GIRARDOT (79). †*C. limaria*, Saharian near Cairo; MAYER-EYMAR (148) p. 72. †*C. lorteti*; GIRARDOT (79) pp. 218, 224, 232, 711. *C.* (*Stereocidaris*) *microtuberculatus*, **n. sp.** (p. 57), *C.* (*Porocidaris*) *misakiensis*, **n. sp.** (p. 58): Sagami Sea, Japan; YOSHIWARA (228) Annot. zool. Japon. ii. †*C. pacomei*; GIRARDOT (79) pp. 193, 218, 224, 229, 232, 277, 711. †*C. pleracanthoides*, **n. sp.**, based on spines from drift (Cretaceous) of Scania; SCHLUETER (194) Zeitschr. Deutsch. geol. Ges. xlix, p. 905, pl. xxxiii: LAMBERT in Review suggests this is deformed by boring mollusc. †*C.* (*Plegiocidaris*)

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prionopleura, **n. sp.**, Sahelian, Algeria; POMEL (175) p. 322, pl. C ii. †*C. pseudopistillum*, redescribed from fresh specimens, and compared with *C. serrata*, *C. herthæ*, *C. darupensis*, *C. hanoverana*; ARNAUD (10) p. 103, pl. ii: but LAMBERT in Review says this is a *Dorocidaris*. †*C. smithi*; WEDD (216) p. 607. †*C. squamifera*, spines from Scania; SCHLUETER (194) p. 905, pl. xxxiii. †*C. spinosa*; GIRARDOT (79) p. 565. †*C. spinulosa*; PETITCLERC (173) p. 125. †*C.*, cf. *spinulosa*; GIRARDOT (79) pp. 218, 234, 240, 279, 711. *C.* (*Stereocidaris*) *tenuispinus*, **n. sp.**, Sagami Sea, Japan; YOSHIWARA (228) Annot. zool. Japon. ii, p. 57. *C. tribuloides*; CLARK (34) p. 412; CLARK (35) p. 4; KOEHLER (117) p. 8. †*C. venulosoides*, **n. sp.**, based on plates from Lower Senonian Trümmerkalk of Balsberg in Scania; SCHLUETER (194) Zeitschr. Deutsch. geol. Ges. xlix, p. 905, pl. xxxiii. †*C.* cf. *wrighti*; GIRARDOT (79) pp. 345, 485, 514. †*C. zschokkei*; PETITCLERC (173) p. 124; GIRARDOT (79) pp. 218, 224, 232, 254, 259, 277, 278, 283, 303, 711. †*C.* sp., Oxfordian (?) of Schachdagh, Caucasus; SPENDIAROFF (202) p. 205. †*C.* sp.; PETITCLERC (173) p. 124. †*C.* sp., various plates and spines from Trümmerkalk of Balsberg in Scania; SCHLUETER (194) pp. 904 & 905, pls. xxxii & xxxiii.

Cidaropsis minor; GIRARDOT (79) pp. 576, 591.

†*Clypeaster*:—*C. acclivis*, **n. sp.** (p. 210, pls. B xxi, lxii), and **n. var.**, *ponsoti* (p. 212, pl. B lxi): Cartennian, Algeria; POMEL (175). *C. acuminatus*; POMEL (175) p. 241, pl. B lxxviii. *C. ægyptiacus* = *C. pliocenicus* and is Pliocene; FOURTAU (68): **n. var.**, *punctalatus*, Helvetian, Algeria; POMEL (175) p. 236, pl. B lxxiv. *C. alticostatus* (p. 243, pl. B lxxix), *C. altus* (p. 261, pl. B xli); POMEL (175). *C. antillarum*, Cuba; EGOZCUE (55) p. 35, pl. vii. *C. atavus* (p. 172, pl. B iii), *C. atlas*, **n. sp.**, Helvetian (p. 252, pls. B xxxv & xxxvi), *C. augustatus* [? err. pro *angustatus*], **n. sp.**, Cartennian (p. 269, pl. B xxxviii), *C. badinskii*, **n. sp.**, Cartennian (p. 212, pls. B lxiii & lxiv), *C. beringeri*, **n. sp.**, Helvetian (p. 199, pl. B lvii): Algeria; POMEL (175). *C.* vel *Echinarachnius brewerianus*; MERRIAM (151). *C. bunopetalus*, **n. sp.**, also as *C. scillæ* ?, Cartennian (p. 204, pls. B xxvi, lx, lxi). *C. cartenniensis*, **n. sp.**, Cartennian (p. 246, pls. B lxxxi & lxxxii), *C. cinalaphi*, **n. sp.**, Helvetian (p. 197, pl. B lvi), *C. cœlopleurus*, **n. sp.**, Helvetian (p. 266, pl. B xc), *C. collinatus*, **n. sp.**, Helvetian (p. 273, pl. B xxxiii): Algeria; POMEL (175). *C. concavus*, Cuba; EGOZCUE (55) p. 36, pl. vii. *C. confusus*, **n. sp.**, Cartennian, Algeria; POMEL (175) p. 190, pl. B xxii. *C. cotteaui*, **n. sp.**, Miocene of Matanzas, Cuba; EGOZCUE (55) p. 40, pl. x. *C. crassicostatus*; POMEL (175) p. 206, pl. B xxiv. *C. cubensis*, Cuba; EGOZCUE (55) p. 33, pl. vi. *C. cultratus*, **n. sp.**, Helvetian (p. 231, pl. B lxix), *C. curtus*, **n. sp.**, Helvetian (p. 267, pl. B xxxi), *C. decemcostatus*, **n. sp.**, also as *C. conoideus* Pom. non Goldf., Helvetian (p. 235, pls. B xlviii, lxxiii), *C. delagei*, **n. sp.**, Cartennian (p. 200, pl. B lviii), *C. demaeghti*, **n. sp.**, Helvetian ? (p. 225, pl. B lxx), *C. disculus*, **n. sp.**, Cartennian (p. 188, pl. B lii), *C. doma*, **n. sp.**, Helvetian (p. 223, pl. B xxxii), *C. expansus*, **n. sp.**, Helvetian (p. 182, pl. B xviii), *C. ficheuri*, **n. sp.**, Cartennian (p. 186, pl. B liii), *C. insignis*, **n. sp.**, Helvetian (p. 238, pl. B lxxv & lxxvi), *C. intermedius* (p. 202, pl. B lix), *C. laboriei*, **n. sp.**, Helvetian (p. 179, pl. B li): Algeria: POMEL (175). *C. laganoides*; PENECKE (171) p. 64. *C. lanceolatus*, **n. sp.**, ex Azpeitia MS., Miocene of Matanzas, Cuba; EGOZCUE (55) p. 39, pl. ix. *C. latus*, **n. sp.**, Helvetian (p. 219, pl. B lxvii), *C. letourneuxi*, **n. sp.**, Pliocene ? (p. 232, pl. B lxxi), *C. megastoma*, **n. sp.**, Sahelian (p. 262, pl. B lxii), *C. myriophyma*, **n. sp.**, Helvetian (p. 228, pl. B xliv), *C. obeliscus*, **n. sp.**, Helvetian (p. 244, pl. B lxxx), *C. obesus*, **n. sp.**, Helvetian (p. 259, pl. B lxxxviii), *C. obtusus*, **n. sp.**,

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Cartennian (p. 247, pls. B xxx, lxxxiii), *C. ogleianus*, **n. sp.**, Helvetian (p. 181, pl. B xix), *C. pachypleurus*, **n. sp.**, Helvetian (p. 270, pl. B xl), *C. paratinus*, **n. sp.**, Helvetian (p. 195, pl. B xxvii): Algeria; POMEL (175). *C. parræ*, Cuba; EGOZCUE (55) p. 31, pl. xi. *C. parvituberculatus*, **n. sp.**, Helvetian, Algeria; POMEL (175) p. 229, pl. B xlvi. *C. parvus*, near Habana, Cuba; EGOZCUE (55) p. 41, pl. xv. *C. peltarius*, **n. sp.**, horizon not given (p. 185, pl. B xx), *C. petalodes*, **n. sp.**, Cartennian (p. 250, pl. B xliii), *C. petasus*, **n. sp.**, Cartennian (p. 193, pl. B xxviii), *C. pierredoni*, **n. sp.**, Helvetian (p. 216, pl. B, lxv), *C. pileus*, **n. sp.**, Helvetian (p. 194, pl. B lv): Algeria; POMEL (175). *C. placunarius*, plain of Tor, near Sinai; FOURTAU (69) p. 18. *C. planicostatus*, **n. sp.**, Sahelian, Algeria; POMEL (175) p. 220, pl. B lxviii. *C. planipetalum*, **n. sp.**, ex Azpeitia MS., Miocene, San Lino factory, Sta. Clara, Cuba; EGOZCUE (55) p. 38, pl. viii. *C. pliocenicus*, **n. sp.**, Pliocene (p. 174, pl. B i), *C. pouyannei*, **n. sp.**, Cartennian (p. 189, pl. B liv), *C. productus*, **n. sp.**, Helvetian (p. 253, pl. B xxix), *C. productus*, **n. var.** *tigaudensis*, Cartennian (p. 255, pl. B lxxxv), *C. pulvinatus*, **n. sp.**, Helvetian (p. 214, pl. B xxxiv), *C. rhabdopetalus*, **n. sp.**, also as *C. crassicostatus* on Plate, Helvetian (p. 208, pls. B xxv, lx, lxii): Algeria; POMEL (175). *C. rosaceus*, concretionary limestone of Bellamar in Matanzas, Cuba; EGOZCUE (55) p. 29, pl. v. *C. scillæ*; PENECKE (171) p. 64. *C. scutellæformis*, **n. sp.**, Eocene (p. 173, pl. B xv), *C. scyphax*, **n. sp.**, Helvetian (p. 233, pl. B lxxii), *C. simoni*, **n. sp.**, Helvetian (p. 217, pl. B lxvi), *C. simus*, **n. sp.**, Sahelian (p. 176, pl. B xvi), *C. sinuatus*, **n. sp.**, Sahelian (p. 177, pl. B xvii), *C. soumatensis*, **n. sp.**, Helvetian (p. 249, pl. B lxxxiv), *C. subacutus*, **n. sp.**, Helvetian (p. 264, pls. B xlvii, lxxxix), *C. subconicus*, **n. sp.**, Sahelian (p. 256, pl. B xxxvii): Algeria; POMEL (175). *C. subdepressus*, recent; CLARK (35) p. 5. *C. subellipticus*, **n. sp.**, also as *C. ellipticus* Pom. non Munst., Helvetian (p. 271, pl. B xxxix), *C. subfolium*, **n. sp.**, Cartennian (p. 184, pl. B li, lii), *C. subhemisphæricus*, **n. sp.**, Helvetian (p. 221, pl. B lxix), *C. suboblongus*, **n. sp.**, Cartennian (p. 192, pl. B xxiii), *C. superbus*, **n. sp.**, Helvetian (p. 257, pls. B lxxxvi & lxxxvii), *C. tessellatus*, **n. sp.**, Helvetian (p. 178, pl. B xv), *C. tumidus*, **n. sp.**, Helvetian (p. 274, pl. B xci), *C. turgidus*, **n. sp.**, Cartennian (p. 226, pl. B xlv), *C. welschii*, **n. sp.**, Helvetian (p. 239, pl. B lxxvii): Algeria; POMEL (175).

†*Clypeus*:—*C. altus*; GIRARDOT (79) pp. 344, 425, 434. *C. ostervaldi*; PETITCLERC (173) p. 128. *C. ploti*; PETITCLERC (173) p. 128; GIRARDOT (79) pp. 344, 377, 390, 401, 409, 415, 485, 503; LAMBERT (128) p. 152. *C.* sp. indet., Bathonian (?) of Alagyr, Caucasus; SPENDIAROFF (202) p. 205.

†*Codiopsis arnaudi*, Cuba; EGOZCUE (55) p. 14, pl. i.

†*Collyrites*:—*C. analis*, Bathonian of Alagyr, Caucasus, measured (p. 203): *C.* cf. *analis*, Callovian of Karadagh, Daghestan, measured (p 204); SPENDIAROFF (202). *C. bicordata*; WEDD (216) p. 604. *C. elliptica*; GIRARDOT (79) pp. 576, 591, 613, 617: Callovian of Karadagh, Daghestan, measured (p. 203), *C. loewinsoni*, **n. sp.**, Oxfordian of Karadagh, Daghestan (p. 201, text-fig.), *C.*, cf. *loryi*, Corallian of Pass Balkar-Digori, Caucasus, measured (p. 204); SPENDIAROFF (202) Beitr. Pal. Oesterr.-Ung. xi. *C. ovalis* (pp. 576, 591, 613, 617), *C. pseudoringens* (p. 591); GIRARDOT (79). *C. rostrata*, **n. sp.**, Bathonian of Alagyr, Caucasus, and *C. warwaræ*, **n. sp.**, Callovian, Pass Balkar-Digori, Caucasus, and Karadagh, Daghestan; SPENDIAROFF (202) Beitr. Pal. Oesterr.-Ung. xi, p. 200, text-figg.

†*Conoclypeus*:—*C. delanouei*, **n. var.**, *milviformis*, Eocene, Libyan series, Egypt; GREGORY (89) Geol. Mag. (n. s.) dec. iv, vol. v, p. 154, pl. vi.

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C. rostratus Tate is a *Plesiolampas*; TATE (205) p. 412; but LAMBERT in Review says it is *Echinolampas*, non *E. rostratus* Cotteau, and proposes *E. tatei*, **nom. nov.** *C. sowerbyi*, **n. sp.**, Londinian, I, near Esneh, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 48, pl. iv.

†*Conolampas letourneuxi*, **n. sp.**, Helvetian ?, Tunis, Algeria; POMEL (175) p. 161, pl. B, iii bis.

†*Coptosoma thevestense*, Egypt; GREGORY (89) p. 152, pl. v.

†*Cyphosoma cubense*, **n. sp.**, Cretaceous, Cienfuegos, Cuba; EGOZCUE (55) p. 12, pl. i.

Cystechinus loveni, **n. sp.**, 1879 fms. off Acapulco (p. 79, pl. ix), *C. rathbuni*, **n. sp.**, 1672–1823 fms. off Mariato Pt. and Malpelo Id. (p. 79, pl. x); AGASSIZ (2) Bull. Mus. Harvard, xxxii.

†*Deakia* Pavay, referred to *Schizobrissus*; POMEL (175) p. 60.

Dermatodiadema, **n. g.** of *Diadematidæ*, based on two **n. spp.**, viz. *D. globulosum*, 1772 fms. Mapelo Id., 1573 fms. off Galera Pt., and *D. horridum*, 902–1772 fms. near Cocos, Malpelo, and Galapagos Id., and off Galera Pt., genus probably incl. *Aspidodiadema antillarum*; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 76, pl. v.

†*Diadema desori*, spines probably of this species recorded from Pliocene of Italy, and compared with Dactylopores; FORNASINI (64): but their Echinoid nature proved, and species compared with *D. saheliense* and *D. calarense*; SACCO (190) p. 73. †*D. ficheuri*, **n. sp.**, Upper Eocene (p. 319, pl. C xiv), †*D. saheliensis* [sic], **n. sp.**, Sahelian (p. 318, pl. C xii): Algeria; POMEL (175). *D. setosum*; CLARK (34) p. 412, and (35) p. 4: shelters a fish; COUTIÈRE (38) p. 238.

Dialithocidaris, **n. g.** of *Arbaciadæ* with genotype *D. gemmifera*, **n. sp.**, 1793 fms., station 3382 [? off Galera Pt.], genus probably incl. *Podocidaris prionigera*; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 75, pl. v.

†*Discoidea decorata*, Cienfugos, Cuba; EGOZCUE (55) p. 23, pl. xii: ?, Lower Cretaceous, Aberdeenshire, described; JUKES-BROWNE (109) p. 28.

Dorocidaris panamensis, **n. sp.**, 66–112 fms., off Cocos Id. and Galera Pt., G. of Panama; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 73, pls. i & ii. *D. papillata*; KOEHLER (117) p. 8; PALLARY (168): *Echinopluteus*, redescr. after Prouho; MORTENSEN (156) p. 110, and (157) p. 78. †*D. pseudohystrix*, **n. sp.**, Pliocene (p. 326, pl. C xiv), †*D. pungens*, **n. sp.**, also as *Cidaris*, Sahelian (p. 325, pl. C ii), †*D. saheliensis*, **n. sp.**, also as *Cidaris*, Sahelian (p. 324, pl. C i), †*D. welschii*, **n. sp.**, Pliocene (p. 327, pl. C xiv): Algeria; POMEL (175).

†*Echinanthus antillarum*, Cuba; EGOZCUE (55) p. 52, pl. xvi. †*E. badinskii*; POMEL (175) p. 121. †*E. parallelus*, **n. sp.**, ex Azpeitia MS. Eocene of Sta Lucia in Sta Clara, Cuba; EGOZCUE (55) p. 53, pl. xii. *E. rosaceus*; CLARK (35) p. 5.

†*Echinarachnius excentricus*; MERRIAM (151). †*E. juliensis*, see *Iheringia*. †*E.* vel *Scutella gibbsi*; MERRIAM (151). *E. parma*; KOEHLER (117) p. 24: breeding season; BUMPUS (24) p. 855: *Echinopluteus*, redescr.; MORTENSEN (156) p. 143, and (157) p. 101. *E. tenuis*, **n. sp.**, Kominato in Awa, Japan; YOSHIWARA (228) Annot. zool. Japon. ii, p. 61.

†*Echinobrissus*:—*E. australiæ* Duncan is a *Cassidulus*; TATE (205) p. 411. *E. clunicularis*; GIRARDOT (79) pp. 344, 377, 415, 485, 514, 576, 591, 597; PETITCLERC (173) p. 130: Bathonian of Alagyr, Caucasus; SPENDIAROFF (202) p. 205: apex of specimen from Comberjon; LAMBERT (128) p. 149, fig. 4. *E. scutatus*; WEDD (216) pp. 602, 604, 607. *E. terquemi*; GIRARDOT (79) pp. 344, 377, 407.

Echinocardium australe, cast up on New Brighton beach, N. Z.; DENDY (46) p. 323. *E. cordatum*; PALLARY (168); LÖNNBERG (134) p. 48: Mediterranean form; KOEHLER (120): individual variations; MARION

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(146) p. 166 : hybrid larvæ ; VERNON (214) : *Echinopluteus*, redescr. ; MORTENSEN (156) p. 146, pl. iv, and (157) p. 102, pl. ix. *E. mediterraneum*, hybrid larvæ ; VERNON (214). †*E. nummuliticum* ; POMEL (175) p. 8. *E. pennatifidum*, sciagram ; WOLFENDEN (227) pl. xii : at Tamaris-sur-Mer (Var); KOEHLER (120): description, compared with *E. cordatum* and *E. flavescens*, incl. *Amphidetus gibbosus* Barrett non Ag. ; KOEHLER (117) p. 24, pls. iii, iv, viii.

†*Echinoconus* :—*E. abbreviatus* and *E. albogalerus* ; SIEGERT (197) p. 95. *E. albogalerus*, in surface drift at Mokattam ; FOURTAU (65) p. 100. *E. antillensis*, Cuba ; EGOZCUE (55) p. 21, pl. iii. *E. castanea*, Lower Cretaceous, Aberdeenshire, doubtful; JUKES-BROWNE (109) p. 28. *E. lanieri*, Cuba ; EGOZCUE (55) p. 19, pl. ii. *E. subrotundus* ; ANASTASIU (6). *E. vulgaris* ; SIEGERT (197) p. 95.

†*Echinocorys* :—*E. carinatus* with 9 genital pores, enlarged fig. ; JANET (106) p. 7, fig. 1. *E. vulgaris*, from Caucasus ; KARAKASCH (103) p. 175, pl. vii. See also *Ananchytes*.

Echinocrepis setigera, **n. sp.**, 1573–1879 fms., off Galera Pt. and Acapulco ; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 78, pl. xiii.

†*Echinocyamus declivis*, **n. sp.**, Cartennian (p. 289, pl. B x), †*E. pliocenicus*, **n. sp.**, Pliocene (p. 292, pl. B xiv): Algeria; POMEL (175). *E. pusillus*; MARION (146) p. 166; LÖNNBERG (134) p. 47 ; PALLARY (168); KOEHLER (117) p. 24: *Echinopluteus*, redescr., nerve-system ; MORTENSEN (156) p. 139, text-fig. 12, pl. iv and (157) p. 98, pl. ix, text-fig. 12. †*E. strictus*, **n. sp.**, Sahelian (p. 291, pl. B x), †*E. tarentinus*? (p. 293, pl. B x), †*E. umbonatus*, **n. sp.**, Sahelian (p. 290, pl. B x): Algeria; POMEL (175).

†*Echinocyphus difficilis*, Lower Cretaceous, Aberdeenshire ; JUKES-BROWNE (109) p. 30.

†*Echinolampas* :—*E. abreviatus* [sic], **n. sp.**, also as *E. curtus* Pom. non Agass., Cartennian, Algeria ; POMEL (175) p. 138, pl. B ix. *E. africanus*, near Sinai ; FOURTAU (69) p. 16. *E. algirus*, **n. sp.**, Pliocene, Algeria ; POMEL (175) p. 158, pl. B, v. *E. amplus* (p. 157), *E. amygdala*, measurements (p. 156); GREGORY (89). *E. amygdalina*, **n. sp.**, Londinian, I, b, & II, c, near Esneh and Siut, Egypt ; MAYER-EYMAR (147), Vierteljahrschr. Ges. Zurich, xliii, p. 49, pl. iii. *E. beaumonti* discussed ; OPPENHEIM (163) p. 162. *E. cartenniensis*, **n. sp.**, also as *E. manzonii*, based on *E. depressus* Manz. non Gray, Cartennian, Algeria ; POMEL (175) p. 136, pl. B viii. *E. castroi*, Cuba ; EGOZCUE (55) p. 57, pl. iii. *E. chelone*, **n. sp.**, Helvetian (p. 157, pl. B vi bis), *E. claudus* **n. sp.**, Cartennian (p. 145, pl. B viii): Algeria ; POMEL (175). *E. clevei*, Cuba ; EGOZCUE (55) p. 61, pl. xix. *E. clypeolus*, **n. sp.**, also as *E. subangulatus* Pom. non Herklotz, Eocene (p. 151, pl. B v), *E. costatus*, **n. sp.**, based on *E. hayesianus* Nic. non Desor, Helvetian (p. 140, pl. B viii bis): Algeria ; POMEL (175). *E. crameri* ; FOURTAU (66) p. 84. *E. duncani*, **nom. nov.** pro *E. obesus* Dunc. & Slad. non Bittner (p. 167), *E. eberti*, **n. sp.**, Upper Oligocene, Doberg bei Bünde, Germany (p. 150, pl. ii); OPPENHEIM (163) Zeitschr. Deutsch. geol. Ges. l. *E. flexuosus*, **n. sp.**, Cartennian (p. 146, pl. B ix); *E. florescens* (p. 128) **n. var.** *avellana* (p. 131), **n. var.** *coarctatus* (p. 130), **n. var.** *maresii* (p. 131), **n. var.** *subpyguroides* (p. 130): Algeria ; POMEL (175). *E. globulus* ; GREGORY (89) p. 156. *E. hayesianus* (p. 144, pl. B ix), *E. icosiensis*, **n. sp.**, Cartennian (p. 149, pl. B vi bis), *E. inæqualis*, **n. sp.**, Cartennian (p. 137, pl. B viii), *E. insignis*, **n. sp.**, Helvetian (p. 153, pl. B v), *E. jubæ*, first figd. as **n. sp.**, then made syn. of *E. algirus* (p. 160, pl. B iv): Algeria ; POMEL (175). *E. lepsiusi*, **n. sp.**, Lower or Middle Eocene, Romallo in S. W. Tirol, and Dos Trentos near Trient ; OPPENHEIM (163) Zeitschr. Deutsch. geol. Ges. l, p. 158, pl. iii. *E. libycus*, measurements ; GREGORY (89) p. 156.

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E. lycopersicus, Cuba; EGOZCUE (55) p. 59, pl. xix. *E. mazzettii*, **n. sp.**, Miocene, Sambuci, Italy; ANGELIS D' OSSAT (9) p. 293, text-fig. *E. minichensis*, **n. sp.**, Londinian, II, c, Minieh, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 49, pl. iv. *E. montevialensis* discussed; OPPENHEIN (163) p. 164. *E. niauisii*; POMEL (175) p. 135. *E. ovum-serpentis*, Cuba; EGOZCUE (55) p. 62, pl. xvi. *E. perrieri*, measurements, Mokattam series, Egypt; GREGORY (89) p. 156. *E. politus* Desm. includes two forms—varr. or spp.; *E.* cf. *politus*, Middle Eocene, Venetia, had the author regarded it as n. sp. he would have called it *E. vitifer*; OPPENHEIM (163) Zeitschr. Deutsch. geol. Ges. l, p. 161 & fig. *E. polygonus*, **n. sp.**, Cartennian?, Algeria; POMEL (175) p. 139, pl. B, viii bis. *E. præcedens*, **n. sp.**, Londinian, I, b, near Esneh, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 49, pl. iv. *E. pyguroides*, **n. sp.**, Cartennian (p. 152, pl. B vi), *E. raymondi*, **n. sp.**, based on *E. hayesianus* Wright & Cott. non Desor, Helvetian (p. 142, pl. B vii bis): Algeria; POMEL (175). *E. semiorbis*, Cuba; EGOZCUE (55) p. 53, pl. xvii. *E. soumatensis*. **n. sp.** (p. 148, pl. B, ix), *E. subhemisphæricus*, **n. sp.** (p. 155, pl. B vii bis): Helvetian, Algeria; POMEL (175). *E. suessi*, discussed; OPPENHEIM (163) p. 159. *E. sulcatus*, incl. ? *E. escheri* Nic. non Agass.; POMEL (175) p. 133. *E. tatei*, **nom. nov.** pro *E.* (olim *Conoclypeus* et *Plesiolampas*) *rostratus* Tate non Cotteau; LAMBERT in Review of TATE (205). *E. tumidopetalum*, **n. sp.**, Miocene, Egypt; GREGORY (89) Geol. Mag. (n. s.) dec. iv, vol. v, p. 155, pl. vi.

Echinometra subangularis; CLARK (34) p. 412, and (35) p. 4; IHERING (102) p. 155. *E. viridis*; CLARK (35) p. 4.

†*Echinoneus cyclostomus* and †*E. orbicularis*, Cuba; EGOZCUE (55) p. 47, pl. xv. *E. semilunaris*; CLARK (34) p. 412, and (35) p. 5.

†*Echinopedina cubensis*, Cuba; EGOZCUE (55) p. 16, pl. ii.

Echinopluteus coronatus, **n. sp.**, Kattegat; (156) p. 136, pl. iv, and (157) p. 96, pl. ix; *E. fusus*, **n. sp.**, Messina, redescr. from Müller; (156) p. 148, and (157) p. 104, text-fig. 13; *E. mülleri*, **n. sp.**, Messina, probably of *Centrostephanus longispinus*; (156) p. 112, and (157) p. 79; *E. solidus*, **n. sp.**, Messina, redescr. from Müller; (156) p. 150, and (157) p. 105; *E. theelii*, **n. sp.**, Kattegat and ? North Sea, of *Echinus* sp. p. 137, ?pl. iv, and (157) p. 97, pl. ix: MORTENSEN (156).

†*Echinospatagus*:—*E.* (*Echinocardium*) *algirus*, **n. sp.**, Pliocene (p. 6, pl. A xvii), *E. cordiformis* (p. 4, pl. A xvii): Algeria; POMEL (175). *E. cordiformis* from Caucasus; KARAKASCH (103) p. 174. *E. mauritanicus*, **n. sp.**, Pliocene, Algeria; POMEL (175) p. 5, pl. A xvii.

Echinostrephus pentagonus, **n. sp.**, Bonin Is., Japan; YOSHIWARA (228) Annot. zool. Japon. ii, p. 59.

Echinus acutus; PALLARY (168); KOEHLER (117) p. 23: hybrid larvæ; VERNON (214): *Echinopluteus*; MORTENSEN (156) p. 132, and (157) p. 93. †*E. algirus*, **n. sp.** (p. 309, pl. C viii), †*E. durandoi*, **n. sp.** (p. 310, pl. C ix): Pliocene, Algeria; POMEL (175). *E. esculentus*, sciagram; WOLFENDEN (227) pl. xiii: 4-rayed; CHADWICK (31): dissection; KÜKENTHAL (123) p. 120: *Echinopluteus*, = "Helgoländsche Seeigellarve" of Müller, redescr.; MORTENSEN (156) p. 134, and (157) p. 94. †*E. etheridgei*, **n. sp.**, Pliocene shell beds of St. Erth, Cornwall, based on plates and spines in Mus geol. Soc. Cornwall; BELL (18) p. 165, pl. iii, fig. 15. *E. melo*; PALLARY (168): ?*Echinopluteus*, redescr.; MORTENSEN (156) p. 135, and (157) p. 96. *E. microtuberculatus*, segmentation of ovum; ZIEGLER (230): larva affected by various chemicals; HERBST (96): hybrid larvæ; VERNON (214), and DRIESCH (54): *Echinopluteus*, redescr.; MORTENSEN (156) p. 130, and (157) p. 92. *E. miliaris*, *Echinopluteus*; MORTENSEN (156) p. 131, pl. iv, and (157) p. 93, pl. viii. *E. multicolor*, **n. sp.**, Akune in Satsuma, Japan;

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YOSHIWARA (228) Annot. zool. Japon. ii, p. 60. *E. sphæra*; KOEHLER (117) p. 23.

†*Enallaster*:—*E. scoticus*, Lower Cretaceous, Aberdeenshire; JUKES-BROWNE (109) p. 30. *E. tschudii*; DOUVILLÉ (51).

†*Encope ciæ*, Cuba; EGOZCUE (55) p. 44, pl. xiii. *E. emarginata*, local name "corrupio"; IHERING (102) p. 155.

†*Eocidaris*? *keyserlingi*, redescr., differences from account by Kolesch, no apparent difference from *Archæocidaris ladina* Stache; SPANDEL (201) p. 33, pl. xiii: see next entry.

†*Eotiaris* **n. g.** pro *Cidaris keyserlingi* Geinitz; LAMBERT in Review of SPANDEL (201) Rev. crit. Pal. iii, p. 82, footnote.

†*Euechinolampas*, section of *Echinolampas*; POMEL (175) p. 128.

†*Eupatagus*:—*E. cotteaui*; GREGORY (89) p. 157. *E. cruciatus*, incl. *E. subrostratus* et *hagenmulleri* Per. & Gauth.; POMEL (175) p. 10. *E. decipiens* Tate, transferred to *macropneustes* "on the authority of Dr A. C. [?J. W.] Gregory"; TATE (205) p. 412. *E. libycus*; GREGORY (89) p. 157.

†*Euspatangus cairensis*; FOURTAU (66) p. 84.

Fibularia acuta, **n. sp.**, Misaki and Shigajima, Japan; YOSHIWARA (228) Annot. zool. Japon. ii, p. 60.

†*Galeropygus*:—*G. agariciformis*; PETITCLERC (173) p. 127: Bajocian, Haute-Saône; LAMBERT (128) p. 143. *G. jolyi*, **n. sp.**, Middle Cenomanian of Angoulême; GAUTHIER (76) Bull. Soc. geol. France (3), xxv, p. 836, text-fig. *G. marcoui*; PETITCLERC (173) p. 127. *G. nodoti*; GIRARDOT (79) pp. 344, 377, 391, 401. *G.* cf. *sulcatus*; PETITCLERC (173) p. 127: "cinquième costale [genital] imperforée en contact avec le périprocte"; LAMBERT (128) p. 144, fig. 1.

Goniocidaris canaliculata, distribution; PRATT (178) p. 17. *G. doederleini*, **n. sp.**, 52 fms., off Cocos Id., G. of Panama; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 73, pl. iii. †*G.* sp.; TATE (205), p. 411.

†*Gualteria orbignyi*; ENGERRAND (57).

†*Guettaria danglesi*, **n. sp.**, Senonian?, Hadjadja in Mascara, Algeria; GAUTHIER (76) Bull. Soc. geol. France (3), xxv, p. 831, pl. xxiv.

†*Haimea delagei*, redescr., see also *Pseudohaimea*, Algeria; POMEL (175) p. 116, pl. B ix bis).

†*Hemiaster*:—*H. antillensis* (p. 72, pl. xxiv). *H. cubensis* (p. 73, pl. xxv), Cuba; EGOZCUE (55). *H. cubicus*, near Sinai; FOURTAU (69) pp. 11, 13. *H. dewalquei*, Cuba; EGOZCUE (55) p. 75, pl. iii. *H.* (*Periaster*) *fourtaui*, **n. sp.**, Parisian, I, e, Mokattam, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 52, pl. 5. *H. heberti*, near Sinai; FOURTAU (69) pp. 9, 13. *H. leymerii*; ANASTASIU (6). *H.* (*Periaster*) *nubicus*, **n. sp.**, Suessonian, I, between Assouan and Kurkur, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 52, pl. vi. *H. schweinfurthi*; GREGORY (89) p. 158. *H. tamulicus* is allied to *H. prunella*, genotype of *Bolbaster* Pomel, and to *H. stella*; LAMBERT in Review of KOSSMAT. *H. wilcocksi*, **n. sp.**, Londinian, I, b, near Esneh, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 51, pl. v.

†*Hemicidaris*:—*H. crenularis*, at St. Clement-lès-Macon, figured; LISSAJOUS (131). *H.* cf. *querangeri* (pp. 576, 591), *H.* cf. *jauberti* (pp. 345, 377, 391, 401), *H. langrunensis* (pp. 345, 509, 514), *H. luciensis* (pp. 345, 509, 514); GIRARDOT (79).

†*Hemigymnia*, **n. g.**, genotype *H. aturica*, **n. sp.**, Lower Garumnian of Rivière (Landes); ARNAUD (10) Act. Soc. Bordeaux, liii, p. 118, pl. ii.

†*Hemipatagus ficheuri*, **n. sp.**, Cartennian, Algeria; POMEL (175) p. 26, pl. A, xxiii.

†*Hemipedina chalmasi*; PETITCLERC (173) p. 129; LAMBERT (128) p. 153.

†*Hemipneustes* sp. Trümmerkalk of Scania, referred provisionally to *Cardiaster*, as *C. ignabergensis*, **n. sp.**; SCHLUETER (194) p. 889.

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Hipponoe esculenta; CLARK (34) p. 412, and (35) p. 5.

†*Holaster*:—*H. altus*, from Wilmington, species incl. *H. bischoffi*; JUKES-BROWNE (108) pp. 246–250, and pl. xxiv. *H. faxensis*, **n. sp.**, ex museum name, Danian of Annetorp in Scania, also Faxe on Seeland; HENNIG (95) Bih. Svenska Ak. xxiv, Afd. iv, No. 2, p. 6, pl.-fig. 1–5: views of Desor and Fischer-Benzon controverted; SCHLUETER (194) p. 898. *H. subglobosus*, relations to *H. altus* and *H. bischoffi*; JUKES-BROWNE (108) p. 248.

†*Holectypus*:—*H. cenomanensis*, near Sinai; FOURTAU (69) p. 13. *H. depressus*; WEDD (216) pp. 602, 604: GIRARDOT (79) pp. 344, 377, 415, 485, 505, 562, 576, 591, 613, 617, 620. *H.* cf. *depressus*, Callovian, Caucasus; SPENDIAROFF (202) p. 205. *H. hemisphericus*; GIRARDOT (79) p. 344. *H. macropygus* from Caucasus; KARAKASCH (103) p. 173, pl. iii (not iv as quoted in text). *H.* cf. *orificatus*, Oxfordian ?, Caucasus; SPENDIAROFF (202) p. 205. *H. punctulatus*; GIRARDOT (79), pp. 576, 591, 613, 617.

Homolampas hastata, **n. sp.**, 976–1132 fms., near Cocos and Malpelo Is.; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 81, pl. xi.

†*Hyboclypus*:—*H. gibberulus*; WEDD (216) pp. 604, 618. *H. subcircularis*; PETITCLERC (173) p. 128: apex described and compared with *H. theobaldi*; LAMBERT (128) p. 145, figg. 2, 3.

†*Hypsoclypus*:—*H. doma*, **n. sp.**, Cartennian (p. 163, pls. B ii, ii bis & iii), *H. latus*, **n. sp.**, Sahelian (p. 167, pls. B i & iii), *H. oranensis*, **n. sp.**, Sahelian (p. 168, pl. B iv), *H. ponsoti*, **n. sp.**, Helvetian (p. 166, pl. B iii), *H. pouyanei* [sic], **n. sp.**, ex Delage MS., Pliocene (p. 169, pl. B iii): Algeria; POMEL (175).

†*Hypsopatagus*—*H.*? *lefebvrei*, Assiut, Egypt; GREGORY (89) p. 157. *H.*, sp., Egypt; GREGORY (89) p. 157, pl. vi.

†*Iheringia*, **n. g.** of Scutellidæ, based on *Scutella patagonensis* Desor and including *Echinarachnius juliensis*, fully described, measured, and figd., and relations to other genera discussed; LAHILLE (126) Revist. Mus. La Plata, viii, p. 437, pls. i & ii.

Laganidea section of *Clypeaster*; POMEL (175) p. 172.

†*Laganum depressum*, var. aff. *attenuatum*, Egypt; GREGORY (89) p. 153. †*L. elongatum*, **n. sp.**, Miocene of Matanzas, Cuba; EGOZCUE (55) p. 26, pl. iv. *L. rostratum*, New Zealand sp. so referred is probably *L. decagonale*; FARQUHAR (61) p. 302. †*L. sinaiticum*, plain of Tor, near Sinai; FOURTAU (69) p. 18.

†*Linthia*:—*L. aschersoni*; GREGORY (89) p. 158. *L. bathyolcos* Dames *pars*, syn. of *L. orbignyi*; OPPENHEIM (163) p. 157. *L. cavernosa*; *L.* (?) *cotteaui*, measurements, allied to *Schizaster*, Libyan series, Egypt; *L. delanouei*, measurements; GREGORY (89) p. 159. *L. esnehensis-aschersoni*, intermediate form; GREGORY (89) p. 158, pl. vi. *L. hessi*, **n. sp.**, Parisian, II, a, near Mokattam, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 53, pl. vi. *L. pulcinella*, **n. sp.**, Middle Eocene, N. of S. Floriano in Valpolicella, Venetia, allied to *L. scarabæus*; OPPENHEIM (163) Zeitschr. Deutsch. geol. Ges. l, p. 155, pl. ii.

†*Lonchophorus* Dames, rejected; POMEL (175) p. 21.

†*Macropneustes* Ag. discussed and restr. (p. 37), *M. abruptus* (p. 38); POMEL (175). *M. antillanus* (p. 95, pl. xxix), *M. clevei* (p. 93, pl. xxviii), *M. cubensis* (p. 91, pl. xxiii), Cuba; EGOZCUE (55). *M. decipiens*; TATE (205) p. 412. *M. elongatus*; POMEL (175) p. 38. *M. minor*; CANU (48) Zool. Rec. 1897 [omitted]. *M. schweinfurthi*, **n. sp.**, Parisian, I, d, Moeleh Oasis (p. 54, pl. vi), *M. sickenbergeri*, **n. sp.**, Londinian, I, b (p. 55, pl. iii), *M. similis*, **n. sp.**, Londinian, I, b, near Esneh (p. 55, pl. vi): Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii.

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†*Maretia* Gray = *Hemipatagus* q. v.; POMEL (175) p. 25.
Mellita sexforis; CLARK (34) p. 412, and (35) p. 5. *M. testudinata*; IHERING (102), p. 155; CLARK (35) p. 5.
Meoma ventricosa, two varieties from Kingston and Port Antonio respectively; CLARK (35) p. 5.
Mespilia levituberculatus, **n. sp.**, Sagami Sea and other locc., Japan; YOSHIWARA (228) Annot. zool. Japon. ii, p. 58.
†*Micraster* (*Epiaster*) *ultimus*, **n. sp.**, Suessonian I, El Karah near Assouan, Egypt; MAYER-EYMAR (147) Vierteljahrsch. Ges. Zurich, xliii, p. 51, pl. vi.
†*Micropsis mokattanensis* [sic]; FOURTAU (65) p. 99.
Miophyma, section of *Clypeaster*; POMEL (175) p. 260.
Moira, subgenus of *Schizaster*, discussed; POMEL (175) pp. 68, 69.
Nina, subgenus of *Schizaster*, discussed; POMEL (175) pp. 68, 69, 87.
†*Nucleolites avellana*, **n. sp.**, Parisian. I, b, Minieh, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 50, pl. iv.
†*Oligophyma*, **n. g.** (p. 307), *O. cellense*, **n. sp.**, Helvetian (p. 307, pl. C x), *O. oranense*, **n. sp.**, Sahelian (p. 308, pl. C x): Algeria; POMEL (175).
†*Opissaster*:—*O. declivis*, **n. sp.**, Pliocene (p. 107, pl. A ix), *O. insignis*, **n. sp.**, Helvetian (p. 105, pl. A xxx), *O. polygonalis*, **n. sp.**, Sahelian (p. 106, pl. A ix): Algeria; POMEL (175).
Ova, subgenus of *Schizaster*, discussed; POMEL (175) pp. 67–70.
Oxypleura, section of *Clypeaster*; POMEL (175) p. 221.
†*Palaechinus*:—*P. paradoxus*, Carboniferous, Kama basin, Russia; STUCKENBERG (204) pp. 231, 343. *P.*, **n. spp.**, sine nomm.; SOREIL (200) p. lxxix. *P.* sp. Permocarboniferous, Artinsk beds, Kama basin, Russia; STUCKENBERG (204) pp. 270, 354, pl. v, fig. 21, a, b.
†*Palæodiadema*, **n. s.-g.**, with type *Pseudodiadema fragile* Wiltsh.; POMEL (175) p. 318.
Palæotropus hirondellei, detailed description; KOEHLER (117) p. 29, pls. v, vi, ix.
Paratina, section of *Clypeaster*; POMEL (175) p. 190.
†*Pedina inflata*, second specimen known; GREPPIN (90) p. 10.
Periaster tenuis, **n. sp.**, 1573–1772 fms.. off Galera Pt.; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 82, pl. xi.
†*Peribrissus*, **n. g.** with genotype *P. saheliensis*, **n. sp.**, Sahelian, Algeria; POMEL (175) p. 63, pl. A iv.
†*Pericosmus*:—*P.* ? *blankenhorni*, **n. sp.**, Mid. Eocene of Aintâb, Syria, apparently 4 genital pores, compared with *P. montevialensis* and *Periaster capellinii*; OPPENHEIM in KINKELIN (115) p. 163, figg. 5 a–d. *P. ficheuri*, **n. sp.** (p. 113, pl. A xxx), *P. icosii*, **n. sp.** (p. 114, pl. A xxx): Cartennian, Algeria; POMEL (175). *P. latus*, Egypt; GREGORY (89) p. 158: Miocene, Sambuci, Italy; ANGELIS D'OSSAT (9) p. 293. *Pericosmus montevialensis* has three genital pores, not four as Dames said, and probably does not include *Periaster capellinii*, it is not Eocene as Cotteau said, but never occurs below Schioschichten, which are Upper Oligocene or Lower Miocene; OPPENHEIM in KINKELIN (115) pp. 165, 166. *P. nicaisii*; POMEL (175) p. 111. *P. peroni*, Egypt; GREGORY (89) p. 158. *P. subæquipetalus*, ? incl. *Linthia bisulca* Gauth.; POMEL (175) p. 112.
Phormosoma hispidum, **n. sp.**, Pacific generally [no depth or locality given] (p. 77, pls. vi & vii), *P. panamensis*, **n. sp.**, 1825 fms., Malpelo Id., perh. a **n. g.** (p. 77); AGASSIZ (2) Bull. Mus. Harvard, xxxii. *P. uranus* = "*P. luculentum* Ag." of Koehler (78, 79) Zool. Rec. 1895, detailed description, intestinal siphon, Stewart's organs, neanic individuals, parasitic Copepod; KOEHLER (117) pp. 10, 20, pls. i, iii, ix.
Phrissocystis **n. g.** of *Ananchitidæ*, based on *P. aculeata*, **n. sp.**, 1067 fms.

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Station 3366 [?near Cocos Id.]; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 80, pl. xii.

†*Plagiobrissus pomeli* Delage, redescr. fr. Pliocene, Algeria; POMEL (175) p. 34, pl. A xxii.

†*Plagionotus* Ag. nom. preocc., revived as *Plagiobrissus*; POMEL (175) p. 34.

Platypleura, section of *Clypeaster*; POMEL (175) p. 174.

Plesianthus ogasawaraensis, **n. sp.**, Bonin Is., Japan; YOSHIWARA (228) Annot. zool. Japon. ii, p. 60.

†*Plesiolampas*:—*P. delagei*, **n. sp.**, olim *P. gauthieri* Pomel non Cott. (p. 123, pl. B ix bis), *P. ficheuri*, **n. sp.** (p. 124, pl. B ix bis): Cartennian, Algeria; POMEL (175). *P. rostratus*; TATE (205) p. 412; but see *Echinolampas tatei*. *P. welschii*, **n. sp.**, Helvetian, Algeria; POMEL (175) p. 125, pl. B ix bis.

Plexechinus **n. g.** allied to *Pourtalesia* and based on *P. cinctus*, **n. sp.**, 676 fms., Tres Marias, G. of California; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 78, pl. viii.

Pliophyma, section of *Clypeaster*; POMEL (175) p. 247.

Podocidaris prionigera, doubtfully referred to *Dialithocidaris*; AGASSIZ (2) p. 75.

Porocidaris cobosi, **n. sp.**, 385 fms., off Chatham Id. (p. 74, pl. iii), *P. milleri*, **n. sp.**, 465–1879 fms., off C. Mala, Malpelo Id., Galera Pt., and Acapulco (p. 74, pl. iv); AGASSIZ (2) Bull. Mus. Harvard, xxxii.

Pourtalesia tanneri, **n. sp.**, 995–1189 fms., Galapagos Is. and G. of California; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 77, pl. viii.

†*Psammechinus duciei*, Helvetian, Egypt; GREGORY (89) p. 151, pl. v: but LAMBERT in Review refers this to *Schizechinus*. †*P. lævior*, **n. sp.**, Sahelian, Algeria; POMEL (175) p. 311, pl. C xii. †*P. lyonsi*, **n. sp.**, Helvetian, Egypt; GREGORY (89) Geol. Mag. (n. s.) dec iv, vol. v, p. 151, pl. v: but LAMBERT in Review refers this to neighbourhood of *Anapesus* as type of **n. g.** *Taxophyma*. *P. microtuberculatus*; MARION (146) p. 172. *P. miliaris*; KOEHLER (117) p. 24; GADEAU DE KERVILLE (74) p. 340. †*P. mirabilis*, Saharian near Cairo; MAYER-EYMAR (148) p. 72. †*P. subrugosus*, **n. sp.**, Sahelian, Algeria; POMEL (175) p. 310, pl. C xii.

†*Pseudocidaris* sp.; GIRARDOT (79) pp. 345, 514.

†*Pseudodiadema*:—*P. bourgueti*, from Caucasus; KARAKASCH (103) p. 172, pl. iii. *P. calloviense*; GIRARDOT (79) pp. 576, 591, 597. *P. depressum*; PETITCLERC (173) p. 129. *P. subcomplanatum* (pp. 345, 377, 415), *P. superbum* (p. 631); GIRARDOT (79). *P.* sp.; PETITCLERC (173) p. 129.

†*Pseudohaimea*, **n. g.**, doubtfully suggested for *Haimea delagei* and *Amblypygus melitensis*; POMEL (175) p. 118.

†*Pseudopygaulus*:—*P. buccalis* (p. 119), *P. maresii* (p. 120), *P. trigeri* (p. 119); POMEL (175).

†*Pygaster*:—*P. laganoides*; GIRARDOT (79) pp. 344, 377, 391, 401, 415. *P. trigeri*; PETITCLERC (173) p. 129; LAMBERT (128) p. 153. *P.* cf. *trigeri*; GIRARDOT (79) pp. 344, 425, 434, 441, 455, 576, 591. *P. umbrella*; WEDD (216) pp. 602, 604.

†*Pygorhynchus grandiflorus*, **n. sp.**, Londinian, II, c, Minieh, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 48, pl. iii.

†*Pygurus*:—*P. depressus*; GIRARDOT (79) pp. 576, 591. *P. nummuliticus*, **n. sp.**, Parisian, II, b, El Boraz, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 50, pl. iii.

†*Pyrina freucheni*, redescr., but not from type; HENNIG (95) p. 8, pl.-figg. 6–10: modification of Desor's diagnosis; SCHLUETER (194) p. 898.

†*Rhabdocidaris*:—*R. copeoides*; GIRARDOT (79) pp. 576, 613, 617. *R.* cf. *cylindrica*, Caucasus; SPENDIAROFF (202) p. 206. *R. horrida*; GREPPIN (90) pp. 8 & 9; PETITCLERC (173) p. 126; GIRARDOT (79) pp. 147,

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193, 218, 224, 232, 234, 240, 259, 278, 279, 303, 324, 711. *R. libyensis*, **n. sp.**, Lower Eocene, Libyan series, near Assiut, Egypt; GREGORY (89) Geol. Mag. (n. s.) dec. iv, vol. v, p. 150, pl. v. *R. moreaui*; GIRARDOT (79) pp. 133, 136, 656. *R.* cf. *nobilis*, Caucasus; SPENDIAROFF (202) p. 206. *R.* sp.; PETITCLERC (173) p. 126.

†*Rhynchopygus zitteli*; GREGORY (89) p. 155.

†*Rotuloidea fimbriata*; POMEL (175) p. 287.

Salenia hastigera; KOEHLER (117) p. 9. †*S. jerofejewi*, Senonian, Simbirsk; LAHUSEN (127) p. 173, fig. 237. *S. miliaris*, **n. sp.**, 782–1672 fms. off Mariato Pt., near Cocos Id. and Malpelo Id., Galapagos Is.; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 74, pl. ii. †*S. scutigera*, Cuba; EGOZCUE (55) p. 8, pl. i. †*S.* (or *Acrosalenia*), sp., with abnormal apex; SIMIONESCU (198) p. 26.

Salmacis globator, New Zealand sp. so referred is probably *S. alexandria*; FARQUHAR (61) p. 302.

Salmacopsis pulchellimus, **n. sp.**, Tomo, Japan; YOSHIWARA (228) Annot. zool. Japon. ii, p. 59.

†*Sarsella*:—*S. ficheuri*, **n. sp.**, Cartennian (p. 3, pl. A xxiii), *S. mauritanica* (p. 1): Algeria; POMEL (175).

†*Schizaster barbarus*, **n. sp.**, Helvetian (p. 75, pls. A x & xxv), †*S. bocchus*, **n. sp.**, Helvetian (p. 81, pl. A xxvi), †*S. bogud*, **n. sp.**, Cartennian (p. 83, pl. A xxvi): Algeria; POMEL (175). *S. canaliferus*; MARION (146) p. 166. †*S. cavernosus*, **n. sp.**, Helvetian (p. 76, pl. A xxv), †*S. christoli*, **n. sp.**, Cartennian (p. 84, pl. A xxvii), †*S. concinnus* (p. 94), †*S. cruciatus*, **n. sp.**, Cartennian (p. 98, pl. A xxvii), †*S. curtus*, **n. sp.**, Cartennian ? (p. 78, pl. A xiv), †*S. ficheuri* (p. 99, pls. A xxviii & xxix): Algeria; POMEL (175). †*S. gaudryi*, anterior ambulacral furrow enlarged, ? as marsupium; GREGORY (89) p. 160. †*S. indigenus*, **n. sp.**, Londinian, I, b, and Parisian, I, c, near Esneh and Beni Gulf, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 53, pl. vi. *S. latifrons*, **n. sp.**, 995 fms. Station 3431 in G. of Panama; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 81, pl. xi. †*S. letourneuxi*, **n. sp.**, Cartennian (p. 79, pl. A xxvi), †*S. maccarthyi* (p. 91), †*S. maurus*, **n. sp.**, Lower Pliocene (p. 87, pls. A xii, xxviii & xxix), †*S. meslei* (p. 93): Algeria; POMEL (175). †*S. mongei*, **n. sp.**, Londinian, I, b, Wady Siut, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 54, pl. vi. †*S. mokattamensis*; GREGORY (89) p. 160. †*S. nicaisei*, **n. sp.**, based on *Hemiaster obesus* Nic. non Desor., Nummulitic Limestone (p. 95, pl. A xvii), †*S. numidicus*, **n. sp.**, Helvetian (p. 103, pls. A xxviii & xxix): Algeria; POMEL (175). †*S. parkinsoni*, Cuba; EGOZCUE (55) p. 84, pl. xxvii. †*S. phrynus*, **n. sp.**, based on *S. scillæ* Nic. non Ag. et Des., and incl. ? *S. eurynotus* Wright non Agass., Helvetian (p. 101, pl. A xxix); †*S. rocardi*, **n. sp.**, Eocene ? (p. 86, pl. A xxvii); †*S. saheliensis*, **n. sp.**, Sahelian (p. 72, pl. A xii), **n. var.**, *attenuatus*, Sahelian (p. 74, pl. A x), **n. var.** *dilatatus*, Sahelian (p. 73, pls. A x & xxv): Algeria; POMEL (175). †*S. scillæ*, Cuba; EGOZCUE (55) p. 82, pl. xxvi. †*S. speciosus*, **n. sp.**, Pliocene (p. 70, pl. A xi), †*S. subcentralis*, **n. sp.**, Cartennian (p. 96, pl. A xiv): Algeria; POMEL (175). †*S. thebensis*; GREGORY (89) p. 160. *S. townsendi*, **n. sp.**, 146–995 fms., various stations in G. of Panama, and 50 miles S. of Guaymas; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 82. †*S. vicinalis*; POMEL (175) p. 89: Mid. Eocene of Aintâb, Syria; KINKELIN (115) p. 162. †*S. zitteli*; GREGORY (89) p. 160.

†*Schizechinus*, made sub-genus of *Anapesus*; POMEL (175) p. 297: see under *Psammechinus duciei*.

†*Schizobrissus*:—*S. mauritanicus*, **n. sp.**, Cartennian (p. 59, pls. A iii & iv), *S. saheliensis*, **n. sp.**, Sahelian (p. 61, pl. A xxiii): Algeria; POMEL (175).

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†*Scutella*:—*S.*, vel *Clypeaster*, *gabbi*, & *S. interlineata*; MERRIAM (151). *S. irregularis*, **n. sp.** (p. 278, pl. B xiii), *S. obliqua*, **n. sp.** (p. 279, pl. B xiv): Cartennian, Algeria; POMEL (175). *S. patagonensis*, see *Iheringia*. *S. sublævis*, **n. sp.**, Eocene, Algeria; POMEL (175) p. 277, pl. B xii. *S. subrotunda*, var. *paulensis*, Egypt; GREGORY (89) p. 153. *S. tetragona*, probably not a *Præscutella*, Algeria; POMEL (175) p. 277. *S.* sp., Miocene, Sambuci, Italy; ANGELIS D'OSSAT (9) p. 295.

†*Scutellina* [of Tate's previous list] "is a misprint for *Scutella*"; TATE (205) p. 411.

†*Semiclypeus*, **n. s.-g.** of *Clypeus*, with genotype *C. pretiosus*, **n. sp.**, Parisian, I, a, Mokattam, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 48, pl. iii.

†*Sismondæa* [? intended for *Sismondia*]:—*S. macrophylla*, **n. sp.**, Parisian, II, b, c, Wady el Tih, Cairo, & *S. zitteli*, **n. sp.**, Londinian, II, c, Minieh, Egypt; MAYER-EYMAR (147) Vierteljahrschr. Ges. Zurich, xliii, p. 47, pl. iii.

†*Sismondia*:—*S. desorii*; POMEL (175) p. 289. *S. logotheti*, in Londinian II of Upper Egypt; *S. planulata* and *S. sæmanni*, Nummulitic Limestone of Mokattam: FOURTAU (67) p. 85.

Spatagodesma, **n. g.** of Spatangoid, with no sp. named, but "specimens" were obtained "during the voyage of the Albatross from New York to San Francisco"; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 83, pl. xii.

†*Spatangus asper*, **n. sp.**, Sahelian, Algeria; POMEL (175) p. 16, pl. A xviii. †*S. austriacus*, Miocene, Sambuci, Italy; ANGELIS D'OSSAT (9) p. 292. †*S. botto-miccai*, **nom. nov.**, pro *S. manzonei* Botto-Micca; VINASSA DE REGNY (215) footnote. [The ignorance shown on p. 83 of last year's Record may be excused by the fact that this new name was published in a footnote to an unsigned review.] †*S. excisus*, **n. sp.**, Sahelian (p. 14, pls. A ii, xviii, also pl. A xv as *S. depressus* junior), †*S. flamandi* Delage, redescr., Pliocene (p. 24, pl. A xx), †*S. oranensis*, **n. sp.**, Sahelian (p. 22, pl. A ii), †*S. pauper*, **n. sp.**, Pliocene (p. 23, pls. A i & ii): Algeria; POMEL (175). *S. purpureus*, sciagram; WOLFENDEN (227) pl. xii: with commensal mollusc; GRIEG (91) p. 27: *Echinopluteus*, redescr.; MORTENSEN (156) p. 150, and (157) p. 105. †*S. saheliensis*, **n. sp.**, Sahelian (p. 13, pl. A xv), †*S. simus*, **n. sp.**, Pliocene (p. 17, pl. A xxi), †*S. subinermis*, **n. sp.**, Pliocene (p. 20, pls. A i, ii, xix, xxi), †*S. tesselatus*, **n. sp.**, Helvetian (p. 12, pls. A xv, xix), †*S. varians*, **n. sp.**, Pliocene (p. 18, pls. A xix & xx): Algeria; POMEL (175).

Sperosoma [melius *Spærosoma*] (p. 15) and *S. grimaldii*, detailed description of test, Stewart's organs, mesenteries, intestinal siphon; KOEHLER (117) p. 16, pls. ii, iii, iv, ix: also figd. by ALBERT, Prince of MONACO, Nature, lviii, p. 202, June 30.

Sphærechinus granularis; KOEHLER (117) p. 23; †POMEL (175) p. 296, pl. C xxii: incl. *S. albidus*; PALLARY (168): hybrid-larva; DRIESCH (54) and VERNON (214): unripe ovum and response to spermatozoon; IWANZOFF (104): fertilisation and segmentation of ovum; ERLANGER (59). *S.* sp. 1, *Echinopluteus*=*Echinus brevispinosus* Risso, redescr.; MORTENSEN (156) p. 115, and (157) p. 81. *S.* sp. 2, *Echinopluteus*; MORTENSEN (156) p. 117, and (157) p. 83.

†*Stereocidaris australiæ*; TATE (205) p. 411. See also under *Cidaris*.

†*Stomechinus*:—*S. andinus*, Chile; FUCINI (71) p. 2. *S. calloviensis* (pp. 563, 576, 591, 597), *S. heberti* (pp. 345, 377, 391, 401, 576, 591), *S. schlumbergeri* (pp. 345, 514), *S. serratus* (pp. 345, 377, 391, 401, 514); GIRARDOT (79). *S. sulcatus*; LAMBERT (128) p. 152; PETITCLERC (173) p. 130; GIRARDOT (79) pp. 193, 206, 218, 224, 231, 711.

Strongylocentrotus dröbrachiensis [sic passim]; KOEHLER (117) p. 24. *S.*

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dræbachiensis, *Echinopluteus*; MORTENSEN (156) p. 128, and (157) p. 90, pls. vii & viii. *S. lividus*; KOEHLER (117) p. 24; PALLARY (168); †POMEL (175) p. 294, pls. C, xii & xiii: ovum; DELAGE (43): unripe ovum and response to spermatozoon; IWANZOFF (104): hybrid larvæ; DRIESCH (54) and VERNON (214): *Echinopluteus*, redescr.; MORTENSEN (156) p. 126, text-fig. 10, and (157) p. 89, text-fig. 10. See also *Toxopneustes*.

†*Taxophyma*, **n. g.**, see under *Psammechinus lyonsi*.

Temnechinus maculatus, pedicellaria; KOEHLER (117) p. 21, pl. viii.

†*Temnocidaris danica* Desor sp. is the only Cidarid known in Faxö limestone; SCHLUETER (194) p. 904.

†*Thagastea luciani*; FOURTAU (66) p. 84.

Toxobrissus pacificus, **n. sp.**, Sandwich Is., Zanzibar, and ? Pt. Mala; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 83, pl. xi.

Toxopneustes dræbachiensis; LÖNNBERG (134) p. 47. *T. variegatus*; CLARK (34) p. 412 and (35) p. 4: local name "pindá"; IHERING (102) p. 155.

†*Trachyaster*, **n. g.**, with genotype *T. globulus*, **n. sp.**, Sahelian, Algeria; POMEL (175) p. 109, pl. A ix.

†*Trachypatagus*:—*T.* ? *brevis*, **n. sp.**, Sahelian (p. 32), *T. gouini*, **n. sp.**, Pliocene (p. 31, pl. A xxiii), *T. oranensis*, **n. sp.**, Sahelian (p. 30, pl. A xvi), *T. tuberculatus* Wright (olim *Spatangus*), incl. *Macropneustes peroni* Cott., redescr. from Cartennian (p. 29, pl. A xxii): Algeria; POMEL (175).

Trigonocidaris albida, plates of periproct; KOEHLER (117) p. 22.

Tripylus discussed; POMEL (175) pp. 69 & 70.

†*Tuberaster* discussed, and *T. tuberculatus*; POMEL (175) pp. 8 & 9.

Urechinus giganteus, **n. sp.**, 995 fms. off Altata, G. of California; AGASSIZ (2) Bull. Mus. Harvard, xxxii, p. 79, pl. viii.

(D.)—ASTEROIDEA.

General account; LAHUSEN (127) p. 158.

Anthenea tuberculosa, "Krystallkörper"; DOEDERLEIN (50) p. 493.

Asteracanthion foncki Phil. (Museum name)=*A. antarctica* Ltk.; *A. germaini* Phil. 1858=*A. tomidata* Sl. 1889; *A. luridum* Phil. 1858 =*A. sulcifera* Perr., 1869; *A. spectabilis* Phil. 1870=*A. sulcifera* Perr. 1869: MEISSNER (150). *A. sulcifera* see *A. luridum* and *A. spectabilis*. *A. tomidata* see *A. germaini*.

Asterias atlantica, v. *A. tenuispina*. *A. calamaria*, two forms at Nelson and Wellington respectively, addition of arms during growth, habitat, giant specimen; FARQUHAR (60) p. 187. *A. forbesi*; DAVENPORT (42) p. 686. *A. glacialis*; MARION (146) p. 172: ♀, with ♂ regions in ovaries; CUÉNOT (41) p. 273 footnote: fertilisation and segmentation of ovum; ERLANGER (59): larva affected by various chemicals; HERBST (96). *A. hispida*, first occurrence on Swedish coast, Öresund; *A. muelleri*: LÖNNBERG (134) p. 48. *A. murrayi*, sciagram; WOLFENDEN (227) pl. ii. *A. pallida*, metamorphosis, stone-canal communicates with axial sinus; GOTO (81). *A. rubens*; LÖNNBERG (134) p. 48: sciagram; WOLFENDEN (227) pl. i: in oyster-parks at Cette; KOEHLER (120): dissection; KÜKENTHAL (123) p. 113: 6-rayed; GADEAU DE KERVILLE (74) p. 334, pl. ii: *Bipinnaria*, discussed, with fig. of muscle-system; MORTENSEN (156) pp. 56, 159, pl. ii, and (157) p. 42, pl. iv. *A. rupicola* not a New Zealand form, that so named by Hutton being *Stichaster suteri*; FARQUHAR (60) p. 189. *A. stellionura* in numbers in White Sea; KNIPOWITSCH (116) p. 318. *A. tenera*, stone-canal communicates with axial sinus; GOTO (81) p. 271, fig. 43. *A. tenuispina*, includes *A. atlantica*, variation in number of rays;

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CLARK (34) pp. 408, 411. *A. vulgaris*, regeneration; KING (114): *Bipinnaria* (=*A. pallidus* Agass.); MORTENSEN (156) pp. 55, 159, and (157) p. 41.

Asterina folium, habitat, one blue; CLARK (34) pp. 408, 411: measurements, variation in colour; CLARK (35) p. 6. *A. gibbosa*, protandry; CUÉNOT (41): ovum, filaments in cytoplasm; BOUIN (22): origin of body-cavities; GOTO (80): stone-canal communicates with axial sinus; GOTO (81) p. 271, fig. 47: metamorphosis; GOTO (82). *A. minuta*; CLARK (35) p. 6. *A. stellifera*; IHERING (102) p. 155.

Asteropsis vernicina, "Krystallkörper"; DOEDERLEIN (50) p. 493.

Astropecten antillensis and *A. articulatus*; CLARK (35) p. 5. *A. bispinosus*, stone-canal communicates with axial sinus; GOTO (81) p. 271, fig. 42. *A. brasiliensis*; IHERING (102) p. 155. *A. duplicatus*; CLARK (35) p. 5. *A. irregularis*, sciagram; WOLFENDEN (227) pls. iii & iv. †*A.* =(*Asterias jurensis* Goldf.); GIRARDOT (79) p. 632.

Bipinnaria abbreviata, **n. sp.**, Labrador current; (156) p. 50, pl. ii, and (157) p. 37, pl. iii; *B. affinis*, **n. sp.**, N. Equatorial current; (156) p. 49, pl. i, and (157) p. 36, pl. ii: MORTENSEN. *B. asterigera*, St. Andrews Bay, young of *Luidia* sp. indet.; MCINTOSH (143) pl. ii. *B. buryi*, **n. sp.**, Naples="Bipinnaria of *Asterias glacialis* ?" of Bury, but this doubtful; (156) p. 42, and (157) p. 31; *B. elegans*, **n. sp.**="Bipinnaria von Marseille" of Müller, perhaps of *Asterias tenuispinus*; (156) p. 44, text-fig. 2, and (157) p. 32, text-fig. 2; *B. gœttei*, **n. sp.**, Naples, probably of *Astropecten*; (156) p. 40, and (157) p. 30; *B. inflata*, **n. sp.**, Guinea current; (156) p. 50, pl. ii, and (157) p. 37, pl. iii; *B. lævis*, **n. sp.**="Brachiolaria von Helsigör" of Müller, probably of *Asterias glacialis*; (156) p. 58, and (157) p. 43; *B. latifrons*, **n. sp.**, Florida current; (156) p. 46, pl. i, and (157) p. 34, pl. iii; *B. megaloba*, **n. sp.**, Sargasso sea, probably of *Asterias*; (156) p. 60, pl. ii, and (157) p. 44, pl. iii; *B. metschnikoffi*, **n. sp.**, Spezia, probably of *Astropecten*; (156) p. 37, text-fig. 5, and (157) p. 28; *B. mülleri*, **n. sp.**="Bipinnaria von Triest" of Müller, probably of *Astropecten*; (156) p. 39, and (157) p. 29; *B. papillata*, **n. sp.**="Brachiolaria von Messina" of Müller, probably of *Asterias tenuispinus*; (156) p. 60, and (157) p. 44; *B. reflexa*, **n. sp.**, C. Verde and Fernando Noronha; (156) p. 48, pl. i, and (157) p. 35, pl. ii; *B. russoi*, **n. sp.**, Naples=Bipinnaria of *Asterias glacialis* apud Russo, but this doubtful; (156) p. 41, and (157) p. 30; *B. simplex*, **n. sp.**, Azores, perhaps also Bermudas; (156) p. 42, pl. i, and (157) p. 31, pl. ii, figg. 3 & ? 4; *B. wilsoni*, **n. sp.**, E. coast of N. America, after figure in BROOKS, Handbk. Invert. Zool.; (156) p. 47, and (157) p. 35: MORTENSEN.

†*Crenaster prisca*; PETITCLERC (173) p. 131.

Cribrella compacta, probably incl. the specimen identified by Hutton as *C. oculata* (p. 191); *C. lukinsii*, **n. sp.**, Carnley Harbour, Auckland Is. (p. 190); *C. ornata* (p. 190): FARQUHAR (60). *C. sanguinolenta*; LÖNNBERG (134) p. 48: stone-canal communicates with axial sinus; GOTO (81) p. 271, figg. 44 & 45.

Culcita schmideliana, "Krystallkörper" (p. 493), measurements of growth-stages compared with *Goniodiscus sebæ* (p. 496); DOEDERLEIN (50). *C.* sp., shelters a Crustacean; COUTIÈRE (38) p. 238.

Culcitidæ, redefined, incl. *Culcita*, *Asterodiscus*, *Anthenea*, *Goniodiscus sebæ*, *G. studeri*; DOEDERLEIN (50) p. 502.

Cycethra simplex, see *Goniodiscus verrucosus*.

Echinaster echinophorus; IHERING (102) p. 155. *E. spinosus*; CLARK (35) p. 6.

Goniodiscus articulatus, "Krystallkörper" (p. 493), referred to *Pentacerotidæ* (p. 502); DOEDERLEIN (50). *G. penicillatus* Phil. 1870= *Odontaster meridionalis* E. Smith, 1876; MEISSNER (150). *G. pleya-*

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della, "Krystallkörper" (p. 493), referred to *Pentacerotidæ* (p. 502); *G. sebæ*, "Krystallkörper" (p. 491), growth-stages (p. 494), incl. *Hosea spinulosa* Gray: DOEDERLEIN (50). *G. verrucosus* Phil. 1857 = *Cycethra simplex* Bell, 1881; MEISSNER (150).

Gymnasteria carinifera, "Krystallkörper"; DOEDERLEIN (50) p. 493.

Gymnasteridæ, discussed; DOEDERLEIN (50) p. 503.

Henricia sanguinolenta, sciagram; WOLFENDEN (227) pls. xi & xii.

Hippasteria, referred to *Pentagonasteridæ*; DOEDERLEIN (50) p. 502.

†*Leptogonium mauritanicum*, **n. sp.**, also as *L. saheliensis*, Sahelian, Algeria; POMEL (175) p. 329, pl. D i.

Linckia guildingii; CLARK (34) p. 412, and (35) p. 6.

Luidia alternata; CLARK (35) p. 5. *L. ciliaris*, sciagram; WOLFENDEN (227) pls. v & vi: St Andrews; M'INTOSH (143) p. 108: *Bipinnaria*, probably incl. Bury's Bipinnaria of *Luidia* sp.; MORTENSEN (156) p. 54, and (157) p. 40. *L. clathrata*; IHERING (102) p. 155: two varieties (? spp.) in Jamaica; CLARK (35) p. 5. *L. sarsi* (?) seu *ciliaris*, sciagram; WOLFENDEN (227), pl. vii. *L. sarsi*, St Andrews; M'INTOSH (143) p. 108: "*Bipinnaria asterigera*" of Sars, redescr., probably incl. Garstang's Bipinnaria of *Luidia* from Plymouth; MORTENSEN (156) p. 51, and (157) p. 38. *L. savignyi*, St Andrews, breeding period; M'INTOSH (143) p. 108. *L. senegalensis*; IHERING (102) p. 155; CLARK (35) p. 5.

Nidorellia armata, "Krystallkörper"; DOEDERLEIN (50) p. 493.

Odontaster meridionalis, see *Goniodiscus penicillatus*.

†*Palæaster*:—*P. eucharis*, Hamilton group, Bartlett's Mills, Ont.; WHITEAVES (222) p. 376. *P.* sp., numerous specimens on *Tetradium* in limest. below Clinton, near Enterprise, Ohio; FOERSTE (62) p. 186.

Palmipes placenta, sciagram; WOLFENDEN (227), pls. viii & ix.

Pentaceros muricatus, "Krystallkörper"; DOEDERLEIN (50) p. 493. *P. reticulatus*; CLARK (35) p. 5; IHERING (102) p. 155. †*P.* sp., ossicles in Miocene of Piedmont; probably includes *Taurogypsina*; SACCO (190) p. 72.

Pentaceropsis obtusatus, "Krystallkörper"; DOEDERLEIN (50) p. 493.

Pentacerotidæ redefined, incl. *Pentaceros*, *Nidorellia*, *Goniodiscus pleyadella*, *G. articulatus*; DOEDERLEIN (50) p. 502.

Pentagonaster parvus ?, small individual; CLARK (35) p. 5.

Phaneraster semilunatus, "Krystallkörper"; DOEDERLEIN (50) p. 493.

Porania pulvillus, sciagram; WOLFENDEN (227) pl. x.

Pteraster pulvillus, large specimen R = 20 mm.; GRIEG (91) p. 25.

Solaster endeca; LÖNNBERG (134) p. 48: stone-canal communicates with axial sinus; GOTO (81) p. 271, fig. 46. *S. papposus*; LÖNNBERG (134) p. 49; GADEAU DE KERVILLE (74) p. 336: sciagram; WOLFENDEN (227) pl. iv.

Stegnaster wesseli, slight differences from type; CLARK (35) p. 6.

Stellaster incei, "Krystallkörper"; DOEDERLEIN (50) p. 493.

Stichaster insignis, local varieties (p. 188). *S. suteri*, var. *lævigatus*, from Auckland Is., and an intermediate var. from Stewart Id. (p. 189); FARQUHAR (60).

†*Taurogypsina taurobaculata*, probably consists of portions of an Asteroid skeleton; SACCO (190) p. 72.

(E.)—OPHIUROIDEA.

General account; LAHUSEN (127) p. 160.

†*Achistrum nicholsoni* Etheridge as *Hol.*, regarded as hooks of Astrophytonid; SPANDEL (201) p. 38.

Amphiura antarctica Ljung. vide *A. chilensis*. *A. chiajei*; LÖNNBERG (134) p. 50; KOEHLER (117) p. 50. *A. chilensis*, incl. *A. antarctica*,

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measurements, colour in spirit, resemblance to *A. occidentalis*; Ludwig (141) p. 760. *A. denticulata*, detailed description; Koehler (117) p. 50, pl. vii. *A. duncani*; Koehler (118) p. 67. *A. duplicata*; Koehler (117) p. 49. *A. elegans*, regular and irregular arrangement of dorsal plates, reddish colour; Grieg (91) p. 26. *A. filiformis*; Koehler (117) p. 50; Lönnberg (134) p. 50. *A. grisea* is the "remarkable Ophiurid from Brazil" of Bell, 1888, autotomy of disc-covering; Sluiter (199) p. 309. *A. longispina*, detailed description; Koehler (117) p. 52, pl. ix. *A. palmerii*; Grave (87) p. 8. *A. patagonica*, from Juan Fernandez, slight variation from type, to this probably belongs Ljungman's "*A. squamata*" from Talcahuano; Ludwig (141) p. 764. *A. relicta*, **n. sp.**, Andaman Is., 7–15 fms., Ganjam coast, 10–25 fms., allied to *A. hastata* and *A. integra*, and less closely to *A. depressa* and *A. andreæ*; Koehler (118) Bull. Sci. France Belgique, xxxi, p. 68, pl. iv. *A. squamata*; Koehler (117) p. 53; Gadeau de Kerville (74) p. 336. *A. tenuispina*, additions to Ljungmann's description; Koehler (117) p. 53, pl. vi.

†*Aspidura scutellata* always on internal casts of *Myophoria lævigata*; Engel (56) p. lvi.

Astrophyton clavatum; Koehler (118) p. 115. †*A.? permianum*, **n. sp.**, Zechstein of Galgenberg, W. of Ranis, of Pössneck, and of Gera; Spandel (201) Abh. Ges. Nurnberg, xi, p. 39, pl. xiii. †*A. sahelensis*, **n. sp.**, Sahelian, Algeria; Pomel (175) p. 332, pl. D ii.

Astroschema koehleri, **n. sp.**, on a Gorgonid, *Mopsea*, from Amboina, 6 arms, of which 3 are in regeneration; Doederlein (49) p. 487, pl. xxxvii.

Euryale aspera, 160 fms., Bali Str.; Koehler (118) p. 114.

Gorgonocephalus agassizi (p. 59); *G. eucnemis* of p. 213, Koehler (165) Zool. Rec. 1897, was a wrong determination (footnote): Koehler (117). *G. chilensis* (incl. *G. pourtalesi*) and *G. lymani*, distrib., measurements, growth and law of branching of arms, hooks on arms, colour in life, the type of *G. chilensis* was a young form; Ludwig (141) p. 775. *G. pourtalesi* Lym., vide *G. chilensis*.

Ophiacantha abyssicola, *C. aristata*, *O. bidentata*; Koehler (117) p. 55. *O. brevispina*, **n. sp.**, B. of Biscay, 166 metres; Koehler (117) p. 56, pls. viii & ix. *O. decora*, **n. sp.**, Torres Id., 40 fms., Andaman Is., 20 fms., S. coast of Ceylon, 34 fms.; Koehler (118) Bull. Sci. France Belgique, xxxi, p. 80, pl. v. *O. pentagona*, **n. var.** *armata*, Azores, 2870 metres (p. 55); *O. setosa*, Azores, redescribed with special reference to buccal plates (p. 57, pl. viii): Koehler (117). *O. vagans*, **n. sp.**, Torres Id., 40 fms., Coast of Ganjam, 28 fms.; Koehler (118) Bull. Sci. France Belgique, xxxi, p. 82, pl. iv.

Ophiactis abyssicola, detailed description; Koehler (117) p. 46, pls. v & vi. *O. affinis*, slight variations in dorsal plates of disc; Koehler (118) p. 71. *O. asperula*, measurements, colour in life and spirit, variation in distrib. of spines; Ludwig (141) p. 752. *O. balli*; Koehler (117) p. 46. *O. brachyura*, **n. sp.**, on a *Spongodes* from Amboina, 6 arms, of which 2 are the larger; Doederlein (49) p. 485, pl. xxxvii. *O. corallicola*; Koehler (117) p. 46. *O. echinata*, **n. sp.**, Azores, 800 metres, based on a very young individual; Koehler (117) p. 48, pl. v. *O. kroyeri*, distrib., habitat, measurements, colour in spirit, young carried by adult, ? viviparous; Ludwig (141) p. 756. *O. macrolepidota*, described, 6 arms, of which 3 are in regeneration; Doederlein (49) p. 484, pl. xxxvii. *O. muelleri*; Clark (34) p. 412. *O. sexradia*, slight variations; Koehler (118) p. 71.

Ophiarthrum elegans, redescr.; Koehler (118) p. 108, pl. iii.

Ophidiaster guildingii; Clark (35) p. 6.

Ophiocampsis pellucida; Koehler (118) p. 87.

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Ophiocnemis marmorata; KOEHLER (118) p. 84.

Ophiocnida echinata; KOEHLER (118) p. 67, pl. v. *O. echinata*, throws off disc-covering along with gonads; SLUITER (199). *O. picteti*, slight variations from the unique type; KOEHLER (118) p. 66.

Ophiocoma brevipes; KOEHLER (118) p. 80. *O. crassispina*; CLARK (34) p. 412. *O. echinata*; GRAVE (87) p. 8: development; GRAVE (86). *O. granulata*, sciagram; WOLFENDEN (227) pl. xiv. *O. lubrica*, **n. sp.**, 30–50 fms., Laccadive Is.; KOEHLER (118) Bull. Sci. France Belgique, xxxi, p. 76, pl. iii. *O. nigra*, increase at Falmouth; VALLENTIN (210) p. 261. *O. pumila*; CLARK (34) p. 412; GRAVE (87) p. 8. *O. riseii*; GRAVE (87) p. 8. *O. rosula*, sciagram; WOLFENDEN (227) pl. xiv. *O. scolopendrina* incl. *O. erinaceus*; KOEHLER (118) p. 78.

Ophioconis forbesi, Azores; KOEHLER (117) p. 58.

Ophiocten hastatum, incl. *O. longispinum* Koehl., detailed description (p. 42, pl. vii); *O. scutatum*, detailed description (p. 44, pl. vii): KOEHLER (117).

Ophioglypha albida; KOEHLER (117) p. 35: a 4-rayed specimen; LÖNNBERG (134) p. 49: *Ophiopluteus*=*Pluteus paradoxus* Müller, redescr.; MORTENSEN (156) p. 69, pl. ii, and (157) p. 49, pl. iv. *O. aspera*, **n. sp.**, Newfoundland, 1267 metres (p. 40, pl. vi). *O. carnea*, described in detail (p. 35, pl. vi); KOEHLER (117). *O. forbesi*, intermediate between *Ophioglypha* and *Ophiomusium*; KOEHLER (118) p. 63. *O. lymani*, Smyth Channel, Patagonia, slight differences from type; LUDWIG (141) p. 471. *O. robusta*; LÖNNBERG (134) p. 49. *O. sarsi*; KOEHLER (117) p. 35: first occurrence so far S., Öresund; LÖNNBERG (134) p. 49. *O. sinensis* (p. 59, pls. ii, iv), *O. stellata*, redescr., compared with *O. carnea* and *O. indica* (p. 59, pl. ii); KOEHLER (118). *O. tessellata*, redescribed, with modifications from type; KOEHLER (117) p. 37, pl. vii. *O. texturata*; LÖNNBERG (134) p. 49; KOEHLER (117) p. 35: *Ophiopluteus*=*Pluteus paradoxus*, var. Müller, redescr.; MORTENSEN (156) p. 71, pl. ii, and (157) p. 51, pl. iv.

Ophiolepis cincta; KOEHLER (118) p. 66. *O. elegans*, *O. impressa*, and *O. paucispina*; GRAVE (87) p. 8. *O. rugosa*, **n. sp.**, 34 fms., Point de Galle, Ceylon; KOEHLER (118) Bull. Sci. France Belgique, xxxi, p. 64, pl. ii.

†*Ophioma*, provisional **n. g.** for *O. juliensis*, **n. sp.**, Sahelian, Algeria; POMEL (175) p. 331, pl. D ii.

Ophiomastix annulosa; KOEHLER (118) p. 84.

Ophiomaza cacaotica, colour (p. 84); *O. mœrens*, **n. sp.**, 8 fms., Cantores Id. in Mergui Archipelago (p. 85, pl. ii): KOEHLER (118) Bull. Sci. France Belgique, xxxi.

Ophiomusium lymani; KOEHLER (117) p. 42.

Ophiomyxa, distribution of genus; PRATT (178) p. 19. *O. brevispina*, **n. var.** *irregularis*, 28–36 fms., Ceylon, Trincomalee, and Andaman Is.; KOEHLER (118) Bull. Sci. France Belgique, xxxi, p. 110. *O. flaccida*; CLARK (34) p. 412. *O. vivipara* at Falkland Is.; PRATT (178) p. 19: incl. *Ophioscolex coppingeri* Bell, extension of distrib. to Calbuco, measurements, "Glasplättchen" in deeper layers of integument (as also in *O. australis* and *O. pentagona*), dorsal shields on arms, variation in number of arm-spines, colour in life, reproduction, brephic stages; LUDWIG (141) p. 768.

Ophionereis porrecta, incl. *O. variegata* and *O. squamata*; KOEHLER (118) p. 74. *O. reticulata*; CLARK (34) p. 412; GRAVE (87) p. 8. *O. schayeri*, fr. Juan Fernandez, relation to New Zealand fauna, measurements, late origin of supplementary dorsal shields, increase in number of arm-spines, colour in life and spirit; LUDWIG (141) p. 764.

Ophiopholis aculeata; KOEHLER (117) p. 46; LÖNNBERG (134) p. 50: breeding season; BUMPUS (24) p. 856: ? *Ophiopluteus*, redescr.; MORTENSEN (156) p. 74, pl. iii, and (157) p. 53, pl. v.

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Ophiophthirius, **n. g.**, with genotype *O. actinometræ*, **n. sp.**, on *A. solaris* from Thursday Id., belongs to *Ophiothrichidæ*; DÖDERLEIN (49) p. 486, pl. xxxvii.

Ophiopluteus affinis, **n. sp.**, Sargasso Sea, probably of an Amphiurid; (156) p. 85, pl. iii, and (157) p. 61, pl. vi; *O. annulatus*, **n. sp.** = "Wurmförmige Asterienlarve" of Müller, not a *Pluteus*, Trieste; (156) p. 93, and (157) p. 66; *O. bimaculatus* Müller sp., redescr., probably of *Amphiura* sp.; (156) p. 82, text-figg. 3, 7, 8, and (157) p. 59, text-figg. 3, 8*a*, *b*; *O. clapuredei*, **n. sp.**, St Vaast, not a true *Pluteus*; (156) p. 90, text-fig. 9, and (157) p. 64, text-fig. 9 *b*; *O. compressus*, **n. sp.**, Danish seas, probably *Ophiocoma* sp. (156) pp. 81, 159, pl. iii, and (157) p. 58, pl. v; *O. coronatus*, **n. sp.**, Shetlands; (156) p. 88, pl. iv, and (157) p. 63, pl. vi; *O. dubius*, **n. sp.**, Kattegat, probably *Ophioglypha* sp.; (156) p. 74, pl. ii, and (157) p. 53, pl. iv; *O. elongatus*, **n. sp.**, Madeira, vermiform not a *Pluteus*; (156) p. 93, and (157) p. 65; *O. henseni*, **n. sp.**, Bermudas; (156) p. 87, pl. iv, and (157) p. 62, pl. vii; *O. krohnii*, **n. sp.**, Madeira, vermiform not a *Pluteus*; (156) p. 92, and (157) p. 65; *O. metschnikoffi*, **n. sp.**, Spezia, not a true *Pluteus*; (156) p. 89, text-fig. 9, and (157) p. 63, text-fig. 9*a*; *O. ramosus*, **n. sp.**, N. Atlantic, probably of *Amphiura* sp.; (156) p. 86, pl. iii, and (157) p. 62, pls. vii & viii; *O. robustus*, **n. sp.**, Fernando Noronha; (156) p. 80, pl. iii, and (157) p. 57, pl. v; *O. similis*, **n. sp.**, 19° 20′ E., 34° 52′ S., probably of an African *Amphiura*; (156) p. 85, pl. iii, and (157) p. 60, pls. v & vi: MORTENSEN.

Ophiopsila pantherina, **n. sp.**, 4 fms., Kings Id. in Mergui Archipelago, and 15–35 fms., Table Id.; KOEHLER (118) Bull. Sci. France Belgique, xxxi, p. 72, pl. iii.

Ophiopteron elegans, Andaman Is.; KOEHLER (118) p. 88.

Ophioscolex coppingeri Bell, vide *Ophiomyxa vivipara*.

Ophiostigma formosa; KOEHLER (118), p. 76. *O. isacantha*; CLARK (34) p. 412.

Ophiothela danæ, 6 arms, of which 3 are in regeneration; DÖDERLEIN (49) p. 486, pl. xxxvii: with **var. nov.** *involuta*, 7–8 fms., L. Chilka; KOEHLER (118) Bull. Sci. France Belgique, xxxi, p. 88.

Ophiothrix comata, redescr., slight variations from type, does not incl. *O. koreana* (p. 105, pl. ii); *O. diligens*, **n. sp.**, 41 fms., Andaman Is., (p. 103, pl. v): KOEHLER (118) Bull. Sci. France Belgique, xxxi. *O. fragilis*, its local occurrence; GADEAU DE KERVILLE (74) p. 336: form *pentaphyllum*; KOEHLER (117) p. 58: *Ophiopluteus*, redescr., observations of Apostolidès rejected; MORTENSEN (156) p. 76, text-fig. 6, pl. iii, and (157) p. 55, text-fig. 7, pl. vi. *O. hirsuta*, incl. *O. punctolimbata*; KOEHLER (118) p. 95. *O. innocens*, **n. sp.**, 34 fms., S. of Ceylon, 6° 1′ N., 81° 16′ E.; KOEHLER (121) Bull. Soc. zool. France, xxiii, p. 164. *O. insidiosa*, **n. sp.**, 34 fms., Point de Galle, 20 fms., Andaman Is. (p. 91, pl. iv); *O. lepidus*, slight variations from type, perhaps incl. *O. fallax*, relations to *O. purpurea* (p. 102); *O. longipeda* (p. 96): KOEHLER (118) Bull. Sci. France Belgique, xxxi. *O. magnifica*, from Falklands; PRATT (178) p. 18. *O. nereidina*; KOEHLER (118) p. 96. *O. oerstedii*; GRAVE (87) p. 8. *O. otiosa*, **n. sp.**, 36 fms., Malabar coast, allied to *O. demessa* (p. 99, pl. iii); *O. propinqua*, redescribed (p. 97, pl. iii); *O. speciosa*, **n. sp.**, shore of Andaman Is., perhaps closely related to *O. aspidota* (p. 93, pl. iv); *O. stelligera* (p. 99); *O. striolata*, variations from Döderlein's description, colour (p. 89); *O. trilineata* (p. 89); *O. triloba*, length of arm-spines (p. 96); *O. vitrea*, dentary papillæ in 3 rows, the "2 rows" of Döderlein a misprint, slight differences from type (p. 101): KOEHLER (118) Bull. Sci. France Belgique, xxxi.

Ophiura appressa; GRAVE (87), p. 8: Bermuda; CLARK (34) p. 412.

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O. brevicauda, and *O. brevispina*; GRAVE (87) p. 8. *O. ciliaris*, sciagram; WOLFENDEN (227) pl. xv. *O. guttata*; GRAVE (87) p. 8. *O. olivacea*, breeding season; BUMPUS (24) p. 856.

Pectinura arenosa (p. 58). *P. gorgonia* (p. 58 pl. ii); KOEHLER (118).

Sthenocephalus, **n. g.** of *Astrophytonidæ* with genotype *S. indicus*, **n. sp.**, Gaspar Str., 30 fms.; KOEHLER (118) Bull. Sci. France Belgique, xxxi, p. 112, pl. v.

†*Uncinulina polymorpha* Terquem as Foraminifer, regarded as hooks of Astrophytonid; SPANDEL (201) p. 38.

(F.)—CRINOIDEA.

General account, division into *Palæocrinoidea* and *Neocrinoidea* retained; LAHUSEN (127) p. 136. Classification of *Crinoidea* "based upon the number and arrangement of the plates in the calyces"; MILLER (153) p. 670. Classification of Wachsmuth & Springer (336) Zool. Rec. 1897, expounded and criticised; BATHER (14).

†*Acrochordocrinus* ? roots, Mid. Lias of Kessik-tash, W. of Angora; POMPECKJ (176) pp. 728, 752, pl. xxx. See also *Cyclocrinus*.

†*Actinocrinus tenuis*; DESTINEZ (47).

Actinometra belli, brachia of young (p. 479, pl. xxxvi); *A. parvicirra*, brachia (p. 479, pl. xxxvi); *A. paucicirra*, brachia, distribution of syzygies, colour (p. 479); *A. pectinata*, cirri, brachia (p. 478); *A. regalis*, cirri, brachia, colour (p. 480); *A. solaris*, cirri, brachia, colour (p. 478): DOEDERLEIN (48).

†*Ancyrocrinus bulbosus*; WHITEAVES (222) p. 375, pl. xlviii.

†*Antedon admirabilis* = *A. avenionensis* var. *minor*, suggested as doubtful **n. sp.** (p. 405); †*A. allardi*, refigd. (p. 409): NICOLAS (162). †*A. ambiguus*, **n. sp.**, Cartennian, Algeria; POMEL (175) p. 334, pl. D ii. †*A. anglesensis*, refigd. NICOLAS (162) p. 408. †*A. avenionensis*, **n. sp.**, Miocene, Avignon; NICOLAS (161) p. 135, & (162) p. 405, text-fig. *A. bidens*, cirri, brachia, covering-plates on genital pinnules, colour; DOEDERLEIN (48) p. 476, pl. xxxvi. *A. brasiliensis*; IHERING (102) p. 156. †*A. cartenniensis*, **n. sp.**, Cartennian, Algeria; POMEL (175) p. 333, pl. D ii. †*A. depereti*, refigd.; NICOLAS (162) p. 409. *A. elegans*, cirri, colour; DOEDERLEIN (48) p. 475, pl. xxxvi. †*A. fontanneri*, centrodorsal redescr. and figd.; NICOLAS (162) p. 407. †*A. glandiferus*[*ra*] **n. sp.**, Miocene, Avignon; NICOLAS (161) p. 135, & (162) p. 406, text-fig. †*A. globosus*, **n. sp.**, Cartennian, Algeria; POMEL (175) p. 334, pl. D ii. *A. imparipinna*, brachia; DOEDERLEIN (48) p. 477. †*A. lineatus*, **n. sp.**, Sahelian, Algeria; POMEL (175) p. 335, pl. D ii. *A. ludovici* (p. 477); *A. microdiscus*, cirri, brachia, tegminals, colour (p. 476, pl. xxxvi): DOEDERLEIN (48). †*A. miocenicus*[*ca*] **n. sp.**, Miocene, Avignon; NICOLAS (161) p. 132, & (162) p. 404, text-fig. †*A. pellati*, centrodorsal redescr. and figd.; NICOLAS (162) p. 407. *A. phalangium*, centrodorsal figd.; NICOLAS (162) p. 410. †*A. pilularis*, **n. sp.**, Miocene, Avignon; NICOLAS (161) p. 134, & (162) p. 405, text-fig. †*A. rhodanicus*[*ca*] centrodorsal descr. and figd.; NICOLAS (162) p. 403. *A. rosacea*; KOEHLER (117) p. 3: deeper water type; MARION (146) p. 172: decrease at Falmouth; VALLENTIN (210) p. 260: ? Quaternary, Algeria; POMEL (175) p. 336, pl. D ii. †*A. solutus*, **n. sp.** (p. 336, pl. D ii), †*A. speciosus*, **n. sp.** (p. 337, pl. D iii): Sahelian, Algeria; POMEL (175). †*A. sphæroidalis*, descr. and figd.; NICOLAS (162) p. 404.

†*Apiocr.* cf. *elegans*; GIRARDOT (79) pp. 345, 509, 514.

†*Arachnocrinus*, relations to *Petalocrinus*, with diagram of *A. bulbosus*; BATHER (16) p. 437.

Articulata Wachsm. and Spr., name objected to; BATHER (14) p. 343.

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†*Balanocrinus*:—*B. pentagonalis* (pp. 565, 632), *B. subteroides*, et aff. (pp. 86, 91, 92, 101, 122, 133, 134, 137, 142, 146, 651), *B.* sp. (pp. 127, 129, 131, 656); GIRARDOT (79).

†*Botryocrinus crassus*, olim *Homocrinus*; WHITEAVES (222) p. 375.

†*Bourgueticrinus* ?, in Chalk at Flamborough Hd.; LAMPLUGH (129) p. 181.

†*Cainocrinus andreæ*; GREPPIN (90) p. 11.

†*Corymbocrinus*, found in Silurian of Chicago; WELLER (220) p. 700.

†*Crotalocrinidæ* relations to *Cyathocrinidæ* and *Petalocrinidæ*; BATHER (16) p. 438.

†*Crotalocrinus*, found in Silurian of Chicago; WELLER (220) p. 700. *C. rugosus* ?; SIEGERT (197) p. 78.

†*Cyathocrinus*:—*C.* ? *fischeri*, **n. sp.**, Zechstein [? of Pössneck, but this not definitely stated], founded on fused IB circlet only, [genus absolutely uncertain, but not a *Cyathocrinus*]; SPANDEL (201) Abh. Ges. Nurnberg, xi, p. 30, pl. xii. *C. maxvillensis*, **n. sp.** Maxville limest, (=Chester group), Newtonville, Ohio, incl. *C. inequidactylus* Whitf. non McCoy [but none of this is a *Cyathocrinus*]; WHITFIELD (223) Ann. N. York Ac. v, p. 577, pl. xiii. *C.* ? *pentagonus*; SIEGERT (197) p. 79. *C.* ? *ramosus* Schloth., from Zechstein, fully redescribed and figd., is a Poteriocrinid [*sensu latissimo*]; SPANDEL (201) p. 21, pl. xii. *C.* ? cf. *ramosus*; ROMANOV (184) p. 10. *C. somersi*, redescr. [not *Cyathocr.*, probably *Delocr.*], Coal Measures, Ohio; WHITFIELD (223) p. 596, pl. xv. *C.* sp., Kungur beds (pp. 294, 360), and Artinsk beds (pp. 270, 354, pl. v, f. 20*a*, *b*), both Permo-carboniferous, also Carboniferous (pp. 231, 343), Kama basin, Russia, all columnals only; STUCKENBERG (204).

†*Cyclocrinus*:—*C. macrocephalus* (pp. 576, 591), *Cyclocrinus* sp. (p. 86); GIRARDOT (79). See also *Acrochordocrinus*.

†*Dendrocrinus* ? sp.; WINTERFELD (226) p. 11.

†*Dolatocrinus*:—*D. canadensis*; WHITEAVES (222) p. 369. *Dolatocrinus depressus*, **n. sp.**, Hamilton Group, Charlestown, Ind.; MILLER in GREENE (88). *D. subaculeatus*, **n. sp.**, Hamilton group, Bartlett's Mills and Thedford, Ont., previously referred to *D. liratus*, respiratory pores figd. (p. 369, pl. xlviii); *D.* cf. *tuberculatus*, Hamilton group, Thedford, Ont. (p. 371); *D.* sp. previously referred to *D. lamellosus*, but probably is **n. sp.** (p. 370): WHITEAVES (222) Contrib. Canad. Pal. i.

†*Encrinites epithonius*, Lenneschiefer; WINTERFELD (226) p. 4.

†*Encrinos*, true meaning of the name; BATHER (13) p. 248.

†*Encrinus* Schulze, 1758; BATHER (13) p. 249. *E. liliiformis*, ANASTASIU (5) p. 892.

†*Entrochus asteriscus*; SIEGERT (197) p. 131.

†*Eucalyptocrinus crassus*; CALVIN (26) p. 157.

†*Eupachycrinus verrucosus*; BAIN (11) pp. 273, 278.

†*Extracrinus subangularis*; GIRARDOT (79) pp. 122, 127, 136, 656. See also *Pentacrinus*.

Flexibilia Zittel, name preferred to *Articulata* Wachsm. & Spr.; BATHER (14) p. 343.

†*Gennæocrinus arkonensis*, **n. sp.**, Hamilton group, Bartlett's Mills, Ont.; WHITEAVES (222) Contrib. Canad. Pal. i, p. 373, pl. xlviii.

†*Gilbertsocrinus spinigerus*; WHITEAVES (222) p. 368: redescr., differences from N. York type, above bone-bed near Columbus, Ohio; WHITFIELD (223) p. 553, pl. xi.

†*Gissocrinus*, relations to *Petalocrinus*; BATHER (16) p. 437.

†*Glyptocrinus basalis*; MALAISE (145) p. 258.

†*Gruphiocrinus* De Kon. and Le Hon, restored in preference to the redefinition by Wachsmuth & Springer; MILLER (153) p. 679.

†*Hexacrinus*:—*H. callosus* ? (p. 28), *Hexacrinus* aff. *interscapularis*, cup, and possibly columnals (p. 11, fig. 1 and p. 23); WINTERFELD (226).

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†*Hydreionocrinus kansasensis*, **n. sp.**, Upper Coal Measures, 700 feet below Cottonwood Limestone, at Neal, Greenwood Co., Kansas; WELLER (217) Tr. N. York Ac. xvi, p. 372, pl. xxxvi.

Isocrinus v. Meyer, 1837, maintained with type *I. pendulus*=*Pentacr. amblyscalaris* Thurm., and with synn. *Isis* Linn. pars, *Pentacrinus* Miller *pars*, *Cainocrinus* Forbes, *Picteticrinus* Loriol, *Cenocrinus* and *Neocrinus* W. Thoms.; BATHER (13).

†*Lobolithus* (=*Camarocrinus*) geogr. and geol. distrib., found in black limestone of Podol, E. Bohemia, regarded as "Brutbefestigungs-apparat"; JAHN (105) pp. 217–220.

†*Megistocrinus*:—*M. farnsworthi*; CALVIN (27) p. 252. *M. rugosus*, young from Thedford, Ont., with analysis of cup of a cotype; WHITEAVES (222) p. 372.

†*Melocrinus*:—*M. milwaukensis*, **n. sp.**, with **n. var.** *rotundus* (p. 121, pl. xiv); *M. nodosus* Hall, redescribed, with **n. var.** *spinosus* (p. 118, pl. xiv); *M. subglobosus*, **n. sp.** (p. 120, pl. xiv): all Devonian, Milwaukee, Wis.; WELLER (219) Ann. N. York Ac. xi.

†*Millericrinus*:—*M. echinatus*; WEDD (216) p. 615. *M. horridus* bored by *Myzostoma*; BOEHM (20) p. 675.

†*Pentacrinos*, true meaning of the name; BATHER (13) p. 248.

†*Pentacrinus* Blumenb. 1804, maintained with type *P. fossilis*=*P. britannicus* Schloth. and *P. briareus* Miller, and with synn. *Polycerus* Waldheim *pars*, *Chladocrinus* Agass., *Extracrinus* Austin; BATHER (13). *P. allardi* "de Loriol," apparently from Miocene of Beaucaire, but the remarks are obscure; NICOLAS (161) p. 137, & (162) p. 397: de Loriol denies paternity of this sp.; PELLAT (170): LAMBERT in Review also admits ignorance of this sp. *P. angulatus*; GIRARDOT (79) p. 651. *P. bajocensis*; PETITCLERC (173) p. 130; GIRARDOT (79) pp. 193, 218, 224, 232, 254, 283, 324, 711, 742, 766. *P. basaltiformis*; GIRARDOT (79) pp. 133, 656: in Servia; RADOVANOVIC (181) p. 51. *P. berthei* [melius *berthæ*] **n. sp.**, Miocene of Angles (Gard); NICOLAS (161) Mem. Ac. Vaucluse, xvi, p. 137, & (162) p. 397, text-fig. *P. bollensis*; GIRARDOT (79) p. 163. *P. bronnii*; SIEGERT (197) p. 94. *P.* aff. *changarnieri* (pp. 576, 591), *P. cingulatus* (p. 632); GIRARDOT (79). *P. crista-galli*; GIRARDOT (79) pp. 193, 218, 254, 283, 711; PETITCLERC (173) p. 131. *P. flamandi*, **n. sp.**, Cartennian, Algeria; POMEL (175) p. 338, pl. C xiv. *P.* (*Extracrinus*) *goniogenos*, **n. sp.**, Mid. Lias of Kessik-tash, W. of Angora, allied to *P. briareus* Miller [*P. fossilis* Blumenb.], based on columnals; POMPECKJ (176) Zeitschr. Deutsch. geol. Ges. xlix, pp. 724, 752, 756, pl. xxx. *P. jurensis*; GIRARDOT (79) pp. 149, 164, 170, 172, 178, 182, 334, 666, 687, 691. *P.* (*Extracrinus*) *lævisutus*, **n. sp.**, Mid. Lias of Kessik-tash, W. of Angora, also in Suanetia, allied to *P. subangularis*, detailed account of stem; POMPECKJ (176) Zeitschr. Deutsch. geol. Ges. xlix, pp. 718, 752, 756, 759, 787, pls. xxx & xxxi. *P. lepidus*; GIRARDOT (79) pp. 149, 164, 172, 178, 182, 666, 687. *P. micryensis*; GIRARDOT (79) pp. 149, 164, 170, 172, 178, 182, 666, 687. *P. miocenicus* de Lor. distinguished from *P. gastaldi*; NICOLAS (162) p. 397. *P. nicoleti* (pp. 345, 377, 401, 576, 591), *P. oceani* (pp. 127, 129, 656), *P. oxyscalaris* (p. 632); GIRARDOT (79). *P. pierredoni*, **n. sp.**, Eocene, ? Suessonian, Algeria; POMEL (175) p. 339, pl. C xiv. *P.* **n. sp.**, aff. *sarthacensis* (pp. 576, 591), *P. tuberculatus* (pp. 79–83, 86, 91, 101, 127, 130, 651, 656); GIRARDOT (79). *P.* sp.; WEDD (216) pp. 602, 604, 606, 607, 608. *P.* sp., Upper Lias of Kessik-tash, W. of Angora; POMPECKJ (176) p. 727.

†*Petalocrinidæ*, **n. fam.**, diagnosed; BATHER (16) p. 438.

†*Petalocrinus*, geological relations (p. 402), detailed anatomical description (p. 407), diagnosis (p. 420), affinities (p. 436), description of *P. angustus*,

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n. sp., Lower Silurian, *b* or *c*, Wisby, Gotland (p. 425, pl. xxv); *P. expansus*, **n. sp.**, Upper Silurian, *f*, Wisby (p. 434, pl. xxv); *P. inferior*, **n. sp.**, Niagara Limestone, Monticello, Jones Co., Ia. (p. 426, pl. xxvi); *P. longus*, **n. sp.**, Niagara Limestone, St. Paul, Ind. (p. 431, pl. xxvi); *P.* (?) *major* Weller, probable syn. of *Omphyma turbinatum* (p. 407); *P. mirabilis* Weller (p. 427, pl. xxvi); *P. visbycensis*, **n. sp.**, Lower Silurian, *b* and *c*, Wisby, Gotland (p. 421, pl. xxv), with possible mutation *senior*, Lower Silurian, top of *c*, Westergarn, Gotland (p. 424, pl. xxv): BATHER (16) Quart. J. Geol. Soc. liv.

†*Pisocrinus gemmiformis* in Dayton Limest. of Lower Niagara, near Lewisburg, Ohio (p. 185), in Laurel Limest. at Osgood, Ind. (pp. 191 & 199); FOERSTE (62).

†*Platycrinus arenosus*; DESTINEZ (47).

†*Poteriocrinus* sp., columnals only, Carboniferous, Kama basin, Russia; STUCKENBERG (204) pp. 231, 343.

†*Pycnosaccus*, found in Silurian of Chicago; WELLER (220) p. 700.

†*Scaphiocrinus* sp.; SOREIL (200) p. lxxix.

†*Stephanocrinus osgoodensis* in Dayton Limest. of Lower Niagara, near Lewisburg, Ohio (p. 185), in Laurel Limest. at Osgood, Ind. (pp. 191, 199); FOERSTE (62).

†*Scyphocrinus elegans*; ROUSSEL (186) pp. 282, 284.

†*Uintacrinus socialis*, description reprinted, two sizes noted, species or growth-stages; LOGAN (133) pp 481–483, pls. lxxi, cxii, cxiii.

†*Zeacrinus*:—*Z. mooresi*, redescr., Coal Measures, Ohio; WHITFIELD (223) p. 597, pl. xv. *Z.* sp.; BAIN (11) p. 280.

(†G.)—CYSTIDEA

(including EDRIOASTEROIDEA).

General account, division into *Eucystoidea*, *Cystocrinoidea*, *Cystasteroidea*, *Cystechinoidea*, *Cystoblastoidea*; LAHUSEN (127) p. 182.

Ageladiscus, **nom. nov.** for *Echinodiscus* Worthen and Miller, nom. preocc., [but is anticipated by *Discocystis* Greg. Feb. 1897]; MILLER (154) p. 734.

Agelacrinus sp. Mourlon 1881, becomes *Dinocystis barroisi*, **n. sp.**; BATHER (16A) p. 543. *A.* sp., numerous specimens on *Tetradium* in limest. below Clinton, near Enterprise, Ohio; FORESTE (62) p. 186.

Astrocystites Whiteaves non *Asterocystis* Haeckel, altered to *Steganoblastus*; WHITEAVES (221).

Atelecystis Billings maintained with *A. huxleyi* as type, and incl. *A. balanoides*; MILLER (153) p. 674.

Caryocrinus ornatus; CALVIN (26) p. 157. *C.* sp., in *Meristella crassa* beds, Ordovician, Ringerike, Norway; KIAER (112) p. 17.

Dinocystis, **n. g.** of Edrioasteridæ, with genotype *D. barroisi*, **n. sp.**, Uppermost Devonian, Psammites du Condroz, Belgium; BATHER (16A) p. 547, pl. xxi.

Echinosphæra, in Pyrenees; ROUSSEL (186) p. 282. *E. aurantium*; SIEGERT (197) p. 50. *E. baltica*; MALAISE (145) p. 258. *E.* sp., Upper *Chasmops* beds, Ordovician, Kristiania; KIAER (112) p. 34.

Edrioasteridæ, **n. fam.**, of Edrioasteroidea, comprising *Edrioaster* and *Dinocystis*; BATHER (16A) p. 547.

Mesites Hoffmann non Boheman, nec Geoffroy St Hilaire, nec Jenyns, nec Ludwig, nom. mut. *Mesocystis*; BATHER (12).

Mesocystis, **nom. nov.** pro *Mesites* (q. v.); BATHER (12).

Sphæronis munitus and *S. punctatus*; MALAISE (144) p. lxxvi. *S. stelluliferus*; MALAISE (145) p. 258. *S.* sp. in *Meristella crassa* beds, Ordovician, Ringerike, Norway; KIAER (112) p. 17.

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Steganoblastus **nom. nov.** pro ***Astrocystites*** Whiteaves non ***Asterocystis*** Haeckel; the type species ***S. ottawaensis*** is (lapsu calami) quoted as ***S. canadensis***; Whiteaves (221).

(†H.)—BLASTOIDEA.

General account; Lahusen (127) p. 191.

Pentremites elegans, redescr. fr. Maxville Limest. Ohio; Whitfield (223) p. 577, pl. xiii. ***P. lycorias***; Whiteaves (222) p. 375.

Pentremitidea filosa ? (p. 122, pl. xiv); ***Pentremitidea milwaukensis***, **n. sp.** (p. 123, pl. xiv); Devonian, Milwaukee, Wis.; Weller (219) Ann. N. York Ac. xi.

(K.)—INCERTAE SEDIS.

†***Tesselaria ambigua***, **n. g.** et **sp.**, perhaps not Echinodermal, Sahelian, Algeria; Pomel (175) p. 339, pl. D iii.

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Professor Alexander Agassiz
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APR 26 1901

A Record of, and Index to, the Literature of ECHINODERMA published during the year 1899, with a few items from previous years.

Compiled by F. A. Bather.

Reprinted, by permission of the Zoological Society, from the Zoological Record *for* 1899. *London:* 1900

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BRITISH MUSEUM (NAT. HIST.),
CROMWELL ROAD,
LONDON, S.W.

Professor Alexander Agassiz

DEAR SIR,

In forwarding the Zoological Record—section Echinoderma, for the year 1899, I beg respectfully to point out that the labour of preparing such an index is greatly lessened when authors are good enough to send copies of their papers.

I should be most grateful for anything that you may publish in any way bearing on Echinoderms; and should also be glad to have for reference any papers already entered in the Record, but not as yet sent by you. I may explain that the greater part of this work has to be done in

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the evenings at my own house, far away from the big libraries; possession of the literature is therefore a necessity if the Record is to be made complete and produced with promptness.

Should it not be in your power to send the return that I ask, I should be glad to have my attention directed by post-card to any of your future publications in which Echinoderms may be mentioned.

Begging you to excuse my boldness in proffering this request,

I have the honour to be,

Dear Sir,

Yours very faithfully,

F. A. Bather

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INDEX-VOLUME

OF THE

ZOOLOGICAL RECORD.

THE Council of the Zoological Society has given instructions for the publication of an Index-Volume to the new generic names mentioned in the 'Zoological Record,' Vols. xvii.–xxxvii. (1880–1900).

The Volumes previous to Vol. xvii. have been indexed in the 'Nomenclator Zoologicus' of Scudder, published by the Smithsonian Institution in 1882. The contemplated Index-Volume of the 'Zoological Record,' in order to increase its usefulness, will include names omitted from Scudder's list and from the volumes of the 'Zoological Record.' Thus zoologists may have at their disposal (in the 'Nomenclator Zoologicus' and the new Index together) a complete list of all the names of genera and subgenera used in zoology up to the end of 1900.

It is earnestly requested that anyone who knows of names omitted from Scudder's 'Nomenclator,' or from the volumes of the 'Zoological Record,' will forward a note of them, together, if possible, with a reference as to where they have been noticed or proposed, so that the new list may be made practically complete. Such information should be addressed to the Editor of the 'Zoological Record,' 3, Hanover Square, London, W.; or to C. O. Waterhouse, Esq., British Museum, Natural History, S. Kensington, London, who is engaged in compiling the list.

The terms of subscription to the Index-Volume will be to Subscribers to the 'Zoological Record,' 10*s.*; to other Subscribers, 15*s.*

Subscribers to the 'Zoological Record' itself should intimate their intention to subscribe to the Index-Volume, as, unless they do so, their names will not be placed on the subscription-list.

A limited number of copies (beyond those required for Subscribers) will be printed. These will be placed at the disposal of the public, at the price of £1 per copy, by the Society, and by Messrs. Gurney & Jackson, 1, Paternoster Row, E.C.

Subscribers' names may be sent to the Zoological Society of London at once; the subscription-list will be closed on the 1st Dec., 1901, and subscriptions must be paid before that date.

P. L. SCLATER,
Secretary.

October 1st, 1900.
Zoological Society of London,
3, Hanover Square, W.

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THE ZOOLOGICAL RECORD.

THE object of the ZOOLOGICAL RECORD is to give, by means of an annual Volume, complete lists of the Works and Publications relating to Zoology in all its branches that have appeared during the year preceding the issue of the Volume, together with full information as to the points they deal with, arranged in such a manner as to serve as an Index to the literature of Zoology in all parts of the globe, and thus to form a repertory which will retain its value for the Student in future years.

The 'Zoological Record' is published for the Society by Messrs. Gurney and Jackson at the price of 30*s*. per volume. But all Members of the Zoological Society of London have the privilege of receiving it, including the cost of delivery (within the United Kingdom), at a subscription price of 20*s*. per annum. This Subscription is due on the 1st of July in every year, and the privilege of Subscription is forfeited unless the amount be paid before the 1st of December following.

The Zoological Society, having purchased the entire stock of the 'Zoological Record,' are able to supply complete sets of the first thirty volumes at the price of £9. 10*s*. Volumes of any single year (exclusive of the last five volumes and Vol. 6) can likewise be supplied at 10*s*. per volume.

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Secretary.

Nov. 1, 1900.
ZOOLOGICAL SOCIETY OF LONDON,
3, HANOVER SQUARE, W.

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XIV. ECHINODERMA.

F. A. BATHER.

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XIV. ECHINODERMA.

BY

F. A. BATHER.

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INTRODUCTION.

I. Titles. The numbered entries in the following list amount to 268, a total which would have been increased had certain translations and republications received numbers, but which, even as it is, overtops the 1898 list by 36 and the previous maximum (of 1891) by 81. The total is thus made up: 1876, 1; 1877, 1; 1878, 1; 1889, 3; 1890, 1; 1891, 1; 1892, 1; 1893, 2; 1894, 2; 1895, 3; 1896, 5; 1897, 6; 1898, 31; 1899, 207; and 1900, 3. The magnitude of the total depends, then, less on the discovery of previous omissions than on the particularly large number of entries pertaining to the year of which this is professedly the record. It is of interest to compare this with the output, as now known, of the preceding years of the decade: 1891, regarded by its Recorder, Mr Minchin, as an exceptionally fertile year, has yielded 178 works; 1892, 164; 1893, 161; 1894, 152; 1895, 163; 1896, 193; 1897, 182; 1898, 198; and, since each of these totals is larger by about 28 than the number originally recorded, we might safely credit the last of the eighteen hundreds with no less than 235 writings relating in whole or part to Echinoderma. This does not take into account some 160 reviews, abstracts, and translations, many of them signed by writers of eminence, and all recorded, though not separately numbered, in the following list. It is of course hoped that the increased numbers may be due in part to the increased experience of the Recorder, as they are in part to the improvement and growth of the

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great libraries, and in even larger part to the generosity and kindly help of fellow-workers who enable the Recorder to deal with much matter that he would otherwise see with great difficulty or not at all. None the less there does seem to be an actual growth of interest in Echinoderma and an absolute increase in the publications that refer to them. Partly this is due to the rise of experimental embryology, which has some of its most tractable material provided by starfish and sea-urchins. Partly it may be that geologists now find it easier to employ both crinoids and echinoids as stratigraphical counters, thanks to the labours of palæontological systematists. Contributions to such outlying branches of the subject, though often of deep significance for the pure specialist in Echinoderms, and therefore rightly recorded here, might in some more philosophical classification of the sciences be far removed from writings descriptive of these animals. But even were this annual Record confined to Echinoderma in their morphographic and taxonomic aspects, its growth would still be apparent; despite the attractions of experimental and mathematical biology, the energy of anatomist and systematist is unabated.

The entries of early date in the present list have been furnished by two important publications hitherto inaccessible, but now visible at the Natural History Museum, London. These are Memorie della Pontificia Accademia dei Nuovi Lincei, and Anales de la Real Academia de Ciencias ...de la Habana. The three entries from 1900 were included before their correct date was ascertained; others originally included have been relegated to that year's Record, and should perhaps have been accompanied by yet others. The private distribution of a few reprints, undated or even wrongly dated, before the definitive publication, is responsible for most of this confusion. Reprints are the blessing of the specialist, but when their bibliographic indications are not merely imperfect but misleading, one is apt to regard them as a curse (see Nature lxi, p. 367, 15 Feb. 1900, and Science xi, p. 231, 9 Feb. 1900). The fault is nearly always the printer's, and the remedy lies with the editor. The editor would also do well to exercise his powers in the case of misleading titles. Who would expect to read about sea-urchins in a memoir on "La faune entomologique du Delagoa," even in an appendix, entitled "Mollusques recueillis au Delagoa"? And if a new name for an Echinoid genus is proposed under the head of "Notes sur *Terebratella*," it seems almost a mercy that it is born a synonym.

II. Biology. A. The flow of speculation that compares Echinoderm larvæ with supposed ancestors of the *Chordata*, continues undisturbed (Masterman 168, 169, Willey 255, MacBride 165), but seems to mean little more than that *Chordata* and *Echinoderma*, and perhaps other Phyla, were independently derived from a group of primitive *Cœlomata*. The view that the chief peculiarities of Echinoderm structure are due to the early intervention of a sessile stage is supported by MacBride (165), Steinmann (223), and Bather (22); but while Bather ascribes to this stage the essential characters of the *Pelmatozoa*, MacBride supposes that the division of the Echinoderm stem into the two great branches (*Pelmatozoa* and *Eleutherozoa* of Bather, *Microphagi* and *Megophagi* of Sollas, 216) took place before the *Pelmatozoa* had been definitely evolved. The difference of view is not great, and at any rate the embryologist and palæontologist agree in recognising a division between the two branches so broad that it precludes the homologies required by the calycinal theory of Lovén & Carpenter.

The speculations of Sollas (216) are chiefly concerned with the homologies of the buccal armature, which structure he has found well-developed in two Silurian Echinoids often supposed to have Cystid affinities. He also thinks that he has found in them an inner and an outer series of ambulacral plates [=flooring-plates and covering-plates], of which the

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inner series corresponds to the ambulacrals of Asteroids. If the observations are correct, then *Palæodiscus* and *Echinocystis* combine what seem to be food-grooves of Pelmatozoan character with a mouth that is not merely Eleutherozoan in position, but provided with well-developed Echinoid jaws. The position seems a difficult one, but is perhaps fortified by the work of JAEKEL & BATHER on *Edrioasteroidea* (*Thecoidea* Jkl.), and is consistent with the above-mentioned view that the Eleutherozoa had a Pelmatozoan ancestry.

The work of JAEKEL (130) on the phylogeny of the *Pelmatozoa* is the largest contribution of the year, and in its combination of philosophic boldness with accuracy in detail, exhaustive treatment with beauty of illustration, it is also the most important. Comparison of its conclusions with those of BATHER (22) shows so many points of agreement as to warrant the belief that a solid advance has been made in our knowledge of the *Cystidea*; at the same time the divergences of opinion between these authors, not to mention HAECKEL, are so profound that it is clear much has yet to be learned. There seems, however, no doubt that the *Edrioasteroidea* should rank as a distinct Class, and nothing but practical convenience has caused their retention with the *Cystidea*, in the present Record. The two great Orders of *Cystidea*, the *Rhombifera* (*Dichoporita* Jkl.) and the *Diploporita*, also seem to be well founded, though doubt still exists as to certain genera classed as *Amphoridea*, *Aporita*, *Carpoidea*, and *Protoblastoidea*. In their views as to the relations of the *Crinoidea* these writers are also at variance, JAEKEL separating the Camerate families as *Cladocrinoidea*, supposed to be quite independently evolved from many-plated Cystids, while BATHER divides them, along with the other crinoids, into forms with a monocyclic, and forms with a dicyclic, base, and regards the Camerata in each division as evolved from the Inadunata.

Among minor evolutionary studies, attention should be directed to ROWE's paper on the *Micraster* in the Chalk of S.E. England (202); only by work of this kind can the true nature of species be understood.

B. Turning to the morphology of the classes, we find RUSSO (204) laying stress on a point already led to its logical conclusion by HAECKEL, namely the homology of the single Holothurian gonad with the lower single portion of the genital rachis in *Crinoidea*; but the attempt to represent this by classificatory names is presumably not intended as a serious contribution to taxonomy. The primitive nature of the single gonad may be inferred from the *Cystidea*, which also show that the madreporite was primitively a single pore, *pace* WILLEY (255). Minor notes on *Synapta* are contributed by CLARK (57), while BORDAS' studies on the generative organs and respiratory trees of *Holothuria* appear in their final form (43, 44). Under *Echinoidea* there is nothing remarkable beyond the work of SOLLAS (216) already referred to. The account of *Asteroidea* in 'Bronn's Thierreich,' begun by LUDWIG, is completed by HAMANN. LÜTKEN & MORTENSEN have discovered curious pores on the arms of *Ophioderma*; but among *Ophiuroidea* the most interesting work is that of SOLLAS (216) on the Silurian *Eucladidæ*, which are found to have neither the arm-structure, nor the orientation assigned to them by GREGORY. A study of some Jurassic crinoids has suggested to BIGOT (39) valuable remarks on the pseudo-monocyclic base. BATHER (24) brings additional facts and arguments to bear on the homologies of the anals in *Crinoidea*, which structures are discussed by SARDESON (207) from a more novel point of view. The anatomy of *Cystidea* and *Edrioasteroidea* receives abundant elucidation at the hands of JAEKEL (130) who deals with the cœlom, hydrocœl, gut, nervous system, gonads, etc., despite the dictum of MACBRIDE that "of the internal structure of Cystids we know next to nothing."

The notes on variation scattered through the literature are as numerous

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as ever, but the only definite study of a case is that by KERFORNE (134), see II, B, ii, d, *1*.

C. The true functions of the pedicellariæ seem at last to have been determined by UEXKÜLL (234, see under III, D, v, a), who presents the results of his physiological studies in an exhaustive paper; the fact that a pedicellaria will not grip on to a portion of a sea-urchin of the same species is termed 'autodermophily,' and ascribed to an actual substance in the skin. The same author investigates the movements of the Echinoid spine (235). An interesting study of the curious power that Holothurians have of distilling their skin "almost to jelly with the act of fear" has been made by LINDEMANN (146), whose observations agree with those of SCHOENLEIN (210) on muscular tonus. A very interesting and valuable paper on the bionomics and physiology of *Synapta* is that by CLARK (57).

D. LO BIANCO'S notes (147) on the animals of the Bay of Naples, though dealing chiefly with the breeding period, contain much of interest in general bionomics. Similar information is given in ALLEN'S account (8) of the fauna of a tract in the English Channel. As usual this section of the Record indexes a large amount of very varied information, often gleaned from the most unpromising sources. MEAD'S report on *Asterias*, though strictly practical and economic, contains interesting notes on bionomics, regeneration, and reproduction; it is curious to learn that a starfish can live without a madreporite for at least five months, while the induction from a long series of experiments, that the arms alone cannot regenerate the disc, and that a starfish torn in half does not become two starfish, is of no less scientific than practical importance. The notes in the rest of the Rhode Island report are worthy of attention (218, 219), as also is the cognate paper by FIELD (86).

F. The structure of Echinoderm ova and spermatozoa is of interest to the general biologist rather than to the specialist on Echinoderms. Turning to Embryology we find GOTO'S conclusions from *Asterias pallida* criticised by MACBRIDE (164), but to some extent confirmed by GRAVE (110), whose account of the early development of *Ophiura* raises many important questions. The note by MACBRIDE (166) on the early development of *Echinus* makes one hope that the full account will not be long in coming. A serious study of the post-larval growth-stages of Ophiuroids has been entered on by LUDWIG (159), and seems at first sight to support the calycinal theory. JACKSON'S interesting memoir (127), arising out of his work on the post-larval growth-stages of Echinoids, brings facts from many animals and plants to illustrate 'localized stages in development,' which appear to be the same as the 'stages of individual morphogenesis' of BUCKMAN & BATHER, Zool. Anz. 1892.

The experimental work on Echinoderm ova tends to show that segmentation results from the addition to the ovum of some unorganized substance, whether an enzyme or merely certain ions. The sensational results of LOEB (150, 152) have, however, been criticised by MORGAN (178). Akin to these studies are the observations of VERNON (240) on the effect of staleness of the gonads.

III. A. The evidence of Echinoderms is marshalled against the bipolar hypothesis by ORTMANN (187) & THOMPSON (230). Faunal studies are numerous; for Scandinavia see NORDGAARD, BIDENKAP, & LÖNNBERG; for a portion of the English Channel, the exhaustive paper by ALLEN (8); for the Adriatic, CONDORELLI (61); for the W. Indies, SONTHONNAX (217), ARANGO Y MOLINA (19), CLARK (56), & VERRILL (244); for the Zanzibar region, LUDWIG (158); for Funafuti, BEDFORD (29), BELL (33), & HEDLEY (118A). HÉROUARD (120, 121) & R. PERRIER (191) describe Atlantic Holothurians; VERRILL (243) deals with Atlantic *Asteroidea*; KOEHLER (142) publishes the complete figures of the deep-sea Ophiuroidea of the Indian

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Ocean; LÜTKEN & MORTENSEN (162) describe those of the E. Central Pacific.

III. B. Among studies of fossil faunas the most important are the writings of AIRAGHI (2, 3, 4) on the Tertiary *Echinoidea* of N. Italy, of ANTHULA (18) on the Senonian of the Caucasus, of FOURTAU (96) on the *Echinoidea* of Egypt, of GRABAU (107, 108) on the palæontology of a Devonian district in New York, of WAAGEN and JAHN (246) on the Palæozoic crinoids of Bohemia, and of WHIDBORNE (250) on the Devonshire fossils, which, though assigned to a Middle Devonian age, have a remarkably Carboniferous aspect. The discovery of a Silurian starfish in New South Wales is published by ETHERIDGE (83). Pre-Cambrian Echinoderms appear in the Record for the first time (MATTHEW, 170). The great work of LÓCZY (149) does not contain much of interest to the echinologist, but should not be allowed to escape the attention of the general palæontologist.

IV. Allusion has already been made to several works dealing with the broader questions of Taxonomy, such as the rehabilitation of *Edrioasteroidea* as a Class by JAEKEL (130, s. v. *Thecoidea*) and BATHER (22), the general phylogenetic classification of the Pelmatozoa, with numerous new Orders, Sub-orders, and Families, by the latter author, and the important systematic monograph of *Cystidea* and *Thecoidea* by the former, the proposal of a new Order of Ophiuroids—the *Ophiocistia*, by SOLLAS (216), who also treats other classificatory questions from a broad and novel standpoint. Here also may be mentioned the attempt of SARDESON (207) to connect the crinoids with the cystids by way of *Carabocrinus* and his new genus *Strophocrinus*. The system of *Holothurioidea* receives accessions from R. PERRIER (191) and HÉROUARD (120, 121), and partial revision from the latter and from CLARK (57). On *Echinoidea*, LAMBERT and GAUTHIER continue to publish valuable notes, while the latter author has materially assisted FOURTAU (96) in his revision of the fossil echinoids of Egypt. KOEHLER (141) and SCHLUETER (209) approach the genus *Echinocardium* or *Amphidetus* from opposite quarters. YOSHIWARA (259) adds further to our knowledge of the fossil urchins of Japan, while some interesting Palæozoic Echinoids are made known by SOLLAS (216) and WHIDBORNE (250). In this group, however, the paper of fundamental importance is that by ROWE (202) already alluded to. Under *Asteroidea* we find extensive revisions by GREGORY (111) on Palæozoic and VERRILL (243) on Recent genera; but it is clear that the classification of SLADEN (whose loss zoology so greatly deplores) will have to be modified before it can accommodate all known forms. A classification of *Ophiuroidea* is also still to seek, and no attempt to present one is made by LÜTKEN and MORTENSEN (162), who content themselves with as little disturbance of existing ideas as possible in their thorough description of the ophiurids dredged by the 'Albatross.' There is more attempt at revision, with a number of new sub-genera, in VERRILL'S paper on Bahama ophiurids (244). A new species is added by KOEHLER to the re-issue of his report on the deep-sea ophiurids dredged by the 'Investigator,' but one would like to know whether certain other changes, duly noted in this Record, are due to intention or to the fact that the author did not see proofs. Antarctic ophiurids are dealt with by LUDWIG (156), who also discusses the crinoids of the same region (157). The chief additions to be noted under *Crinoidea* are numerous new genera from the lower Palæozoic rocks of Bohemia, described by WAAGEN and JAHN (246), and numerous new species from the Devonian of S.W. England, described by WHIDBORNE (250); unfortunately nearly all these are admittedly based on unsatisfactory material. The classification of WACHSMUTH & SPRINGER receives criticism from BATHER (24) and JAEKEL (129), while the latter is responsible for a new genus of *Botryocrinidæ* (128). Many new species of *Cystidea*,

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some unfortunately not figured, are described in the otherwise magnificently illustrated monograph of JAEKEL (130). Two new British *Blastoidea* are described by WHIDBORNE (250), and a complete Index to the genera and species of this Class has been issued by the British Museum (26). Finally, the lists of new Echinoderms of various Classes are notably increased by the veteran P. DE LORIOL (154, 155).

The additions to our systematic lists may be analysed thus :—

	New genera	Altered generic names	New sub-genera	New species	New varieties
Holothurioidea	0	0	0	12	3
Echinoidea	7	5	0	55+1?	2
Asteroidea	17	1	0	26	1
Ophiuroidea	16	0	5+2?	75+1?	2?
Crinoidea	9	1	0	25	4
Cystidea	10	1	0	49	6
Blastoidea	0	0	0	2	0
Total	59	8	5+2?	244+2?	16+2?

The list may not be correct, and, even as it stands, contains elements of doubt, due to the extreme difficulty of deciding in some cases whether the name in question is really new, or put forward as new, and whether it is intended for a species or a variety, a genus or a sub-genus. If the author himself knows what he means, is it too much to ask that he should pass the information on to his readers? Here again is the Editor's opportunity.

This Introduction began by remarking on the quantity of literature relative to Echinoderms produced during the year 1899. The condensed and imperfect summary that has been given, shows that the quality of the work also stands at a high level.

In the following Record personal remarks by the Recorder are placed, as heretofore, in square brackets.

CORRIGENDA (in Record of Echinoderma in Vol. XXXV).

The following additions and corrections should be made in the Record for 1898 :—

p. 10. bottom of page, as No. 48 (omitted) insert DOEDERLEIN (77) of present Record.

p. 22. Nos. 174, 175 POMEL, for correct dates see under POMEL p. 26 of this Record.

p. 26. No. 221. Ami in Ottawa Nat. xiii, p. 55, gives date of issue as July, 1899, thus bringing the choice up to seven.

p. 39. III, B, ii, d & e, should be d & f.

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I. TITLES.*

1. AGASSIZ, A. The islands and coral reefs of Fiji. Bull. Mus. Harvard, xxxiii, iv+168 pp., cxii pls. [III, D, iii.]

1A. AGUILERA, J. G. Sinopsis de geología Mexicana. Bol. Com. geol. Mexico, No. iv–vi, pp. 187–250. (1897.) [III, B, ii, c; iii, b, *1*, c.]

2. AIRAGHI, C. Echinidi del Pliocene Lombardo. Atti Mus. Milano, xxxvii, 357–377, 1 pl. (Jan.) [III, B, ii, c. IV, C.]
Abstracts: in Boll. Com. geol. Ital. xxx, p. 171, 1899; by P. E. VINASSA DE REGNY, Riv. ital. Pal. iv, p. 89 (May ? 1899). Critical review by J. LAMBERT, Rev. paleozool. iii, pp. 118, 119, July (1899).

3. ——. Echinidi di Carcare, Dego, Cassinelle e dintorni. Atti Mus. Milano, xxxviii, pp. 245–251. (Aug.) [III, B, ii, d, e. IV, C.]
This is preliminary to AIRAGHI (4).

4. ——. Echinidi del Bacino della Bormida. Boll. Soc. geol. Ital. vol. xviii, pp. 140–178, pls. vi, vii. [III, B, ii, d, e. IV, C.]
Review by J. LAMBERT, Rev. paleozool. iv, pp. 91, 92 (April, 1900). Abstract by V[INASSA DE REGNY], Riv. ital. Pal. v, p. 69 (30 Sept. 1899).

5. ALBERT HONORÉ CHARLES (Prince de MONACO). Sur la quatrième campagne de la Princesse-Alice. C.R. Ac. Sci. cxxvi, pp. 311–314. (Jan. 1898.) [II, B, ii, c. III, A, ii.]

6. ——. Première campagne de la Princesse-Alice II^e. C.R. Ac. Sci. cxxviii, pp. 212–214. (Jan.) [III, A, v.]

7. ALBRECHT, E. Untersuchungen zur Structur des Seeigeleies. SB. Ges. Munchen, xiv, pp. 133–141. [II, F, iii.]

8. ALLEN, E. J. On the Fauna and Bottom-Deposits near the Thirty-Fathom Line from the Eddystone Grounds to Start Point. J. Mar. Biol. Ass. (n. s.) v, pp. 365–542, with 16 folding charts (being the whole of No. 4). (June.) [II, D, iii, iv, vi, viii. III, A, ii.]

9. ALMERA, J. Compte-rendu de l'excursion du 28 Septembre à Sans et à Montjuich. Bull. Soc. geol. France (3), xxvi, pp. 680–689. (Dec.) [III, B, ii, d.]
Abstract by J. LAMBERT, Rev. paleozool. iv, p. 94 (April, 1900).

10. ——. Compte-rendu de l'excursion du jeudi 29 Septembre à Olesa, La Puda et à Montserrat. Bull. Soc. geol. France, xxvi, pp. 690–712. (Dec.) [III, B, ii, f.]
Abstract by J. LAMBERT, Rev. paleozool. iv, p. 94 (April, 1900).

11. ——. Compte-rendu de l'excursion du jeudi 6 Octobre à Castelldefels et Costas de Garraf. Bull. Soc. geol. France, xxvi, pp. 801–811. (Dec.) [III, B, iii, b, *2*.]
Abstract by J. LAMBERT, Rev. paleozool. iv, p. 94. (April, 1900.)

12. AMI, H. M. On some Cambro-Silurian and Silurian fossils from Lake Temiscaming, Lake Nipissing and Mattawa outliers. Rep. Geol. Surv. Canada (n. s.), x, pp. 289i–302i. (Sept.) [III, B, iv, g, h.]

* An asterisk prefixed to a quotation indicates that the Recorder has not seen the Paper or Work referred to.
The Symbols in [] refer to the divisions of the Subject-Index, II, III, IV. Those referring to the Systematic portion [IV, A—K] are inserted only when some question of definite importance to the systematist is dealt with in the work.

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13.*ANDRES, A. L'arbero genealogico degli animali. Prolusione al corso di Zoologia ed Anatomia comparata iniziato nella R. Università di Parma. Parma; Pellegrini, 8vo, 18 pp. [II, A, ii.]

ANDREWS, E. A. See RHUMBLER (197A).

14. ANGELIS D'OSSAT, G. DE & LUZJ, G. F. Altri fossili dello Schlier delle Marche. Boll. Soc. geol. Ital. xviii, pp. 63, 64. [III, B, ii, d.]

An Appendix to ANGELIS D'OSSAT & LUZJ (9), Zool. Rec. 1897.

——. See VERRI, A. & ANGELIS D'OSSAT, G. DE (242).

15. ANON. Reports of Field Excursions. Excursion to Beverley, Walkington, etc. Tr. Hull geol. Soc. i, pp. 12, 13. (1894.) [III, B, iii, b, *1.*]

16. ——. Reports of Field Meetings. Beverley, Walkington, Little Weighton, etc. Tr. Hull geol. Soc. iii, pp. 13, 14. (1896.) [III, B, iii, b, *1.*]

17. ——. Echinoderms at the British Museum. Nat. Sci. xv, pp. 4, 5 (July.) [II, E, i, c.]

18. ANTHULA, D. J. Ueber die Kreidefossilien des Kaukasus, mit einem allgemeinen Ueberblick ueber die Entwicklung der Sedimentärbildungen des Kaukasus. Abth. I of Neue Forschungen in den Kaukasischen Ländern. Beitr. Pal. Oesterr.-Ung. xii, pp. 55–159, pls. i–xiii. [III, B, iii, b, *1.* IV, C, F.]

19. ARANGO Y MOLINA, R. Radiados de la Isla de Cuba. (Equinodermos.) An. Ac. Habana, xiv, pp. 312–318. (1878.) [III, A, ii.]

ARNAUD, H. (15) Zool. Rec. 1897. Abstracts: Bull. Soc. Ouest France, ix, Analyses p. 51 (30 Sept. 1899); by A. TORNQUIST, N. Jahrb. Min. 1900, ii, pp. -160, 161- (June, 1900).

20. ATHANASIU, S. Geologische Studien in den nordmoldauischen Karpathen. Jahrb. geol. Reichsanst. xlix, pp. 429–492, 15 text-figg. (30 Nov.) [III, B, iii, b, *1.*]

21. AURIVILLIUS, C. W. S. Om hafsevertebraternas utvecklingstider och periodiciteten i larvformernas uppträdande vid Sveriges vestkust. Bih. Svenska Ak. xxiv, Afd. iv, No. 4, 92 pp. (1898.) [II, F. iv.]

22. BATHER, F. A. A phylogenetic Classification of the Pelmatozoa. Rep. Brit. Ass. 1898, pp. 916–923. (Feb.) [II, A, iii: B, i, a, *2*; g, 5. IV, A, F, G, H.]

Review by J. LAMBERT, Rev. paleozool. iv, pp. 25, 26 (Jan. 1900).

23. ——. The horizon of *Dinocystis Barroisi*. Geol. Mag. (n. s.), dec. iv, vol. vi, pp. 134–136, text-fig. (March.) [III, B, iv, f. IV, G.]

24. ——. Wachsmuth and Springer's Monograph on Crinoids. Last two notices. Geol. Mag. (n. s.), dec. iv, vol. vi, pp. 32–44, with 19 figg., 117–127. (Jan., March.) [II, B, i, f, 5. IV, F.]

25. ——. Wachsmuth and Springer's Monograph on Crinoids. Being a review reprinted from the Geol. Mag. 1898–99; to which are added an Obituary Notice and portrait of Charles Wachsmuth, from the Geol. Mag. for 1896, also a list of the published scientific writings of Charles Wachsmuth, and an Index to the Review, now first printed. 8vo, London, Dulau (April, 1899).

[See BATHER, F. A. (15) Zool. Rec. 1898 and (24) this Record; and II, E, iii.]

Reviews: Ottawa Natural. xiii, p. 115 (July, 1899); by J. LAMBERT, Rev. paleozool. iv, pp. 26, 27 (Jan. 1900); by C. R. KEYES, Amer. Geol. xxiv, pp. 56–58 (July, 1899).

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26. [BATHER, F. A.] The Genera and Species of Blastoidea, with a list of the Specimens in the British Museum (Natural History). x+70 pp., 8vo, London (22 April). [II, E, i, c. IV, H.]
Reviews: Geol. Mag. (n. s.), dec. iv, vol. vi, p. 428 (Sept. 1899); by C. SCHUCHERT, Science (n. s.), x, p. 495 (6 Oct. 1899).

27. ——. The fauna of the Sound. Abstracted from the Swedish of Dr Einar LÖNNBERG. Nat. Sci. xv, pp. 263–273 (Oct.), and Corrigenda, p. 372 (Nov.). [III, A, i; ii.]
See LÖNNBERG (134) Zool. Rec. 1898, and (153) of this Record.

——. See also VENYUKOV (239), and WAAGEN & JAHN (246).

28. BEDFORD, F. P. Holothurians. A. Willey's Zool. Results, Part II, pp. 141–150, pl. xvii. (Jan.)
[II, B, ii, c; d, *2*: D, viii. III, A, iv. IV, B.]
Abstract by H. LUDWIG, Zool. Centrlbl. vi, p. 468 (4 July, 1899).

29. ——. Report on the Holothurians collected by Mr J. Stanley Gardiner at Funafuti and Rotuma. P. Zool. Soc. London, 1898, pp. 834–848, pls. lii, liii. (1 April, 1899.)
[II, B, ii, d, *2*: D, viii: F, vii, b. III, A, iv. IV, B.]

30. BEEDE, J. W. New fossils from the Kansas Coal Measures. Kansas quart. viii, pp. 123–130, pls. xxxii, xxxiii. (July.)
[III, B, iv, d. IV, C, F.]

31. BELL, A. Pleistocene fossils from Co. Antrim. Irish Natural. viii, pp. 210, 211. (Sept.) [II, B, ii, b.]

32. BELL, F. J. Report on the Echinoderms (other than Holothurians) collected by Dr Willey. A. Willey's Zool. Results, Part II, pp. 133–140, pl. xvii. (Jan.) [II, D, viii. III, A, iv. IV, C, D, E.]
Abstract by H. LUDWIG, Zool. Centrlbl. vi, p. 468 (4 July, 1899).

33. ——. On the Actinogonidiate Echinoderms collected by Mr J. Stanley Gardiner at Funafuti and Rotuma. P. Zool. Soc. London, 1898, pp. 849, 850. (1 April, 1899.) [III, A, iv.]

34, 35, 36. BERG, C. Substitución de nombres genéricos. Comun. Mus. Buenos Aires, i, pp. 16–19 (24 Aug. 1898); pp. 41–43 (17 Dec. 1898); pp. 77–80 (24 May, 1899). [IV, C.]

BERGERON, C. See FOUQUÉ (92).

BERGH, R. S. See DRIESCH (80), LOEB (152), and MORGAN (178).

BERTRAND, —. See FOUQUÉ (92).

37. BIDENKAP, O. Undersøgelser over Lyngenfiordens evertebratfauna. I. Storfjorden. Tromso Mus. Aarsh. xx, pp. 81–103. [III, A, ii.]

38. ——. Troms⌀sundets Echinodermer. Tromso Mus. Aarsh. xx, pp. 104–112. [II, B, ii, c: D, iii. III, A, ii. IV, D, E.]

39. BIGOT, A. Echinodermes Bathoniens du Calvados. Bull. Soc. Normand. (5), ii, pp. 39–46. (Jan. ?)
[II, B, i, f, *5*: E, iii. III, B, iii, c, *3*. IV, F.]

40. BOECKH, H. Die geologischen Verhältnisse der Umgebung von Nagy-Maros. Mt. Ungar. geol. Anstalt, xiii, Heft 1, 64 pp., ix pls., 5 text-figg. [III, B, ii, e.]

BOEHM, J. See NOETLING, F.

41. BOFILL Y POCH, A. Indicaciones sobre algunos fósiles de la caliza basta blanca de Muro, isla de Mallorca. Bol. Ac. Barcelona (3), i, pp. 391–413. (Jan.) [III, B, ii, d.]

42. BONARELLI, G. I fossili Senoniani dell' Appennino centrale che si conservano a Perugia nella Collezione Bellucci. Atti Acc. Torino, xxxiv, pp. 1020–1027, 1 double plate. [III, B, iii, b, *1*. IV, C.]

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Abstracts: by V[INASSA DE REGNY], Riv. ital. Pal. v, p. 91 (31 Dec. 1899); by J. LAMBERT, Rev. paleozool. iv, pp. 133, 134. (July, 1900.)

43. BORDAS, L. Étude sur l'anatomie et les fonctions physiologiques des poumons aquatiques des Holothuries. Ann. Mus. Marseille Zool. v, Mem. No. 3, 16 pp., pl. i. [II, B, i, b, *6*: c, ii, iii, v, vii.] Abstracts by H. LUDWIG, Zool. Centrlbl. vii, p. 140 (16 March, 1900) and Zool. Jahresber. 1899 (Sept., 1900). For prelim. abstract, and abstracts thereof, see BORDAS (21) Zool. Rec. 1898.

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45. BOULE, M. Note sur de nouveaux fossiles secondaires de Madagascar. Bull. Mus. Paris, 1899, pp. 130–134. [III, B, iii, b, *1*.]

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48. BRÜHL, —. Ueber Verwendung von Röntgen'schen X-strahlen zu palæontologisch-diagnostischen Zwecken. Arch. Physiol. 1896, pp. 547–550. (28 Dec. 1896.) [II, E, i, b.]

49. BUMPUS, H. C. The breeding of animals at Woods Holl during the month of May, 1898. Science (n. s.), viii, pp. 58–61. (15 July, 1898.) [II, F, iv.]

50. BUTTS, E. Description of some new species of Crinoids from the Upper Coal Measures of the Carboniferous Age at Kansas City, Missouri. Tr. Acad. Sci. Kansas, i, pp. 13–15, i pl. (12 April, 1898). [III, B, iv, d. IV, F.]

51. CAPON, J. Compte-rendu des travaux de la société pendant l'année 1898. Bull. Soc. Rouen, xxxiv, pp. 387–405 (Dec. 1899 ?). [III, B, iii, b, *1*.]

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53. ——. Fósiles de la Isla de Cuba, pertenecientes al género *Asterostoma*. An. Ac. Habana, xiii, pp. 549–553. (1877.) [Not Indexed.]

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55. CHADWICK, H. C. [Report on work at Port Erin in 1898.] In W. A. HERDMAN'S 12th Ann. L. M. B. C. Rep. Tr. Liverp. Biol. Soc. xii, pp. 23–27. [III, A, ii.]

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Abstract by H. LUDWIG, Zool. Centrlbl. vii, p. 140 (6 March, 1900.]

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120. HÉROUARD, E. Note préliminaire sur les Holothuries provenant des dragages du Yacht *Princesse-Alice*. [Première Note.] Bull. Soc. zool. France, xxi, pp. 163–168. (1896.) [III, A, ii. IV, B.]
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124. HOVEY, H. C. The life and work of James Hall, LL.D. Amer. Geol. xxiii, 137–168, pls. iv, v (March). [II, E, iii.]

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129. ——. [Referat ueber] CH. WACHSMUTH & FR. SPRINGER: The North American Crinoidea Camerata [(336) Zool. Rec. 1897]. N. Jahrb. Min. 1899, i, pp. 374–383 (Feb.). [II, B, i, f, *5*. IV, F.]

130. ——. Stammesgeschichte der Pelmatozoen. I Thecoidea und Cystoidea. 4to, x+442 pp., xviii pls., 88 text-figg. Berlin: Springer. (Nov.) [II, A, iii: B, i, f, *5*, *6*; g, *4–10*, *12*; h, *5*; ii, d, *1*; e: C, iii: D, iii: E, iii, iv: F, vii. III, B, iv, a. IV, G. K.]
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II. BIOLOGY.

(A.) EVOLUTION.

i. **General Principles**:—Regularity of structure repeatedly induced by sessile mode of life, exemplified by Echinoderma; STEINMANN (223) p. 25. See also JACKSON under II, F, i.

ii. **Relations of Echinoderma**:—to lower *Chordata*, *Enteropneusta*, etc.; grouped with *Hemichorda* as *Bilateralia*, which is not intended as a taxonomic division, also characterised as *Hydrotrema* as opposed to *Branchiotrema*; WILLEY (255) pp. 296, 297.—Relations to a supposed primitive group, *Archicoelomata*, and to the hypothetical ancestor of that group; MASTERMAN (169).—Relations of larvae to *Protochordata*; MASTERMAN (168).—Phylogeny of Animal Kingdom; ANDRES (13).

Origin of Echinoderms, "Stem cloven into two" [i.e. *Pelmatozoa* and *Eleutherozoa*], "at the very base"; MACBRIDE (165).—Light thrown by palæontology on the *Pentactaea* theory; STEINMANN (223) p. 23.

iii. **Phylogenies of smaller groups**:—General interrelations of Classes of *Echinoderma*; BATHER (22) p. 917.

Change of form in *Elpidiinæ*; HÉROUARD (121), p. 172, text-fig. 4.

Evolution of *Echinoidea* from *Asteroidea* maintained, origin of buccal armature; SOLLAS (216) p. 710.—Evolution of Cretaceous species of *Micraster*, from zone of *Rhynchonella cuvieri* to that of *M. coranguinum*; ROWE (202).—Evolutionary change of miliary granules and tubercles in *Micraster cor-anguinum* group during Senonian time; LAMBERT in FORTIN (89) p. 360.—Supposed genetic relations of Tertiary *Ech.* in northern California; MERRIAM (175) p. 165.—Evolution of *Pliolampas* and *Bothriolampas* from *Echinanthus* and *Bothriopygus* respectively; GAUTHIER in FOURTAU (96) p. 654.

Evolution of *Ast.*; HAMANN (118) pp. 740–743.

Evolution of *Pelmatozoa* and relations to other *Echinoderma*, recognition as a Sub-phylum (p. 917), Phylogeny of *Crinoidea* (p. 918); BATHER (22).—Relations of *Crinoidea* to *Cystidea*, in light of *Strophocrinus*, dual origin of *Monocyclica*; SARDESON (207) pp. 269 et sqq.

Evolution and phylogeny of *Cystidea*; BATHER (22) p. 917.—Relations of *Cystidea* (Jkl.) to other Echinoderms, and their own phylogeny (pp. 155–174), Phylogeny of *Scoliocystidæ* (p. 247), Phylogeny and relations of *Caryocrinidæ* (p. 305), Phylogeny of *Echinosphaeridæ* (p. 324), Phylogeny of *Diploporita* (p. 368), Phylogeny of *Thecoidea* (= *Edrioasteroidea*) (p. 29); JAEKEL (130).

Blastoidea, origin, relations, and principles of classification; BATHER (22) pp. 917, 918.

(B.) MORPHOLOGY.

i. **Anatomy**:—

a. *ECHINODERMA.*

1. General accounts:—Vacant.
2. Symmetries:—Origin of radiate and esp. pentamerous symmetry; BATHER (22) p. 917.
3. Homologies of Classes:—Vacant.
4. Skeletal tissue or Stereom:—Vacant; but see (c, f, g) *4*.
5. Skeletal Anatomy:—Vacant.
6. Hydrocoel &c.:—In evolution of nephridia, definite regional pores suggested as differentiation from "indefinite condition as

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seen in the multiple madreporites of many Echinoderms"; WILLEY (255) p. 313.

7. Coelom and other Body-cavities:—Vacant.
8. Digestive System:—Vacant; but see b, *8*.
9. Nervous Systems:—Vacant.
10. Mesodermal tissues (exc. Skeletal):—Vacant.
11. Axial organ or Ovoid gland:—Vacant.
12. Genital System:—of *Hol.* and *Crin.* contrasted with that of *Ech.*, *Ast.*, and *Oph.*; RUSSO (204), see under IV, A.

b. *HOLOTHURIOIDEA.*

1, *2* & *3*. Vacant.

4. Skeletal tissue:—Spicules of *Synapta roseola* and *S. inhaerens*, difference of size in different regions of body in *S. inhaerens*; CLARK (57) pp. 23, 24, 26, pl. xi.
5. Skeleton:—Calcareous ring of *Synapta roseola* and *S. inhaerens*; CLARK (57) p. 23, pl. xi.
6. Hydrocoel &c. Respiratory Trees:—Respiratory trees of *Holothuria* and *Stichopus*; BORDAS (43).
7. Coelom and other Body-cavities:—Ciliated funnels of *Synapta roseola* and *S. inhaerens*, size, distribution; CLARK (57) p. 24, pl. xi.
8. Digestive System:—Cuvierian organs homologous with stomachic caeca of Asteroids, their histology; RUSSO (203).
9. Nervous System:—"Otocysts" of *Synapta roseola* and *S. inhaerens*; CLARK (57) p. 28.

10 & *11*. Vacant.

12. Genital System:—Anatomy and histology of generative organs of *Hol.*, esp. *Holothuria tubulosa* and *H. impatiens*; BORDAS (44).

c. *ECHINOIDEA.*

1—3. Vacant.

4. Skeletal tissue or Stereom:—Crystallography of plates of test of *Echinocorys vulgaris*, partially silicified, and of spines of undetermined Echinoid, both from Senonian of Glons, Belgium; CESÀRO (54) p. 99.
5. Skeleton:—Evolution of the following features in the test of *Micraster* in Upper Cretaceous time: interporiferous area of ambulacrum, general shape of ambulacrum, length, breadth, and height of test, elevation outline, rostrum and carina, apical system, anteal sulcus and ambital notch, position of mouth, labrum, peristome, periplastronal area, sub-anal fasciole, and minor points; ROWE (202).

 Ambulacra,—compared with those of *Ast.* and *Mesocystis* (p. 706), of *Palæodiscus* (pp. 703, 705), of *Echinocystis* (p. 708 & figg. 12-14): SOLLAS (216).—Atrophy of pores in anterior ambulacrum of n. g. *Lambertia*; OPPENHEIM (186).

 Buccal armature,—homologies discussed (p. 710), of *Palæodiscus* (pp. 703, 713), of *Echinocystis* (p. 707); SOLLAS (216).

 Periproctal plates of *Discoides*, figd. and distinguished as 'opercular,' 'valvular,' 'central,' and 'intermediate'; LAMBERT in FORTIN (91) p. 21.—Number and distribution of genital pores in genera of exocyclic *Ech.*, especially *Plesiospatangus*; GAUTHIER (102) p. 344, text-fig. 1.

 General anatomy of spines; UEXKÜLL (235) p. 74.—Pedicellariae described and figd.; UEXKÜLL (234).

6-12. Vacant.

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d. *ASTEROIDEA.*

1–4. Vacant.

5. Skeleton :—Ambulacra compared with *Ech.* and *Mesocystis*; SOLLAS (216) p. 706.

Buccal armature, homologies discussed; SOLLAS (216) p. 711.

Pedicellariæ described and figd.; UEXKÜLL (234) p. 354.

6. Vacant.

7. Coelom and other Body-cavities :—Body-cavity of *Ast.* in general; HAMANN (118) pp. 623–625.—Pseudhaemal spaces, canal-system of integument, and of body-wall, general account concluded; LUDWIG (160).

8–12. Vacant; but see b, *8.*

e. *OPHIUROIDEA.*

1. Vacant.

2. Symmetries :—Orientation of *Eucladia*; SOLLAS (216) p. 692.

3, 4. Vacant.

5. Skeleton :—Hollow arm-spines of *Ophiacantha vivipara* and other *Oph.*, systematic and functional importance discussed; LUDWIG (157) p. 15.—Pores at inner edge of second ventral plate in all spp. of *Ophioderma* examined, and sometimes also at 3rd ventral plate (p. 100), pores in arm of *Ophiernus* (p. 111); LÜTKEN & MORTENSEN (162).—Arm-structure of *Eucladidæ*; SOLLAS (216) pp. 693, 696, 699.

"Outer mouth-papillæ" Lyman, called "distal oral tentacle-scales" in *Amphiuridæ* and *Ophiacanthidæ*, also apical "mouth-papillae" Lyman, called "tooth-papillae" in *Ophiacanthidæ*; VERRILL (244) pp. 3, 4.—Buccal armature of *Eucladidæ*; SOLLAS (216) pp. 692, 695, 699.

6–12. Vacant.

f. *CRINOIDEA.*

1. Vacant.

2. Symmetries :—Pentamerous and hexamerous; SARDESON (207) p. 272.

3. Vacant.

4. Skeletal tissue or Stereom :—Crystallography of columnals of *Bourgueticrinus* from Senonian of Glons; CESÀRO (54) p. 101.

5. Skeleton :—General discussion, and terms applied to Bohemian Palæozoic *Crin.* (pp. 1–9), also detailed study of *Scyphocrinus* (pp. 61–74); WAAGEN & JAHN (246) pp. 1–9.

Radials of Camerata (=Cladocrinoidea) not homologous with radials of other crinoids (=Pentacrinoidea) and should be called 'costalia'; JAEKEL (129) p. 377.—Tetramerism of Camerate base is primitive; JAEKEL (129) p. 376.—Law of Wachsmuth & Springer stated in novel form, pseudomonocyclic bases discriminated as 'crypto-dicyclic' with IBB invisible, and 'ocheto-dicyclic' with IBB obsolete, the latter stage being more common in later spp.; BIGOT (39) p. 68.—Infrabasals in some specimens of *Uintacrinus socialis*, though absent in most; SPRINGER (220).

Supposed orals of Camerata not homologous with those of *Antedon* and other Pentacrinoidea (Jkl.); JAEKEL (129) p. 378.—Tegmina of *Scyphocrinus*?; WAAGEN & JAHN (246) p. 119, pls. lxiv, xlix, lv.

Anal plates,—homologies, esp. in *Inadunata*; BATHER (24) pp. 32–44.—Discussed in light of *Strophocr.*; SARDESON (207) p. 270.

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Biserial brachials not derived from uniserial, but independently developed and actually of greater geological age, pinnules of Camerata (Cladocrinoidea) not homologous with those of other crinoids (Pentacrinoidea), which latter are 'ramuli'; JAEKEL (129) p. 377.—'Dactyli' 'fingers,' new term for pinnulæ of *Cladoidea* (Jkl.); JAEKEL (130) p. 87.—Covering-plates on genital pinnules of *Antedon bidens*; DOEDERLEIN (77) p. 476.

Stem,—Origin of [nothing new]; SARDESON (206).—Of *Strophocrinus*, and origin in *Crin.* generally; SARDESON (207) p. 274. —Of Palæozoic *Crin.*, its variations and diagnostic value; WAAGEN & JAHN (246) pp. 135–140. — Of *Scyphocrinus*; WAAGEN & JAHN (246) pp. 73, 115.—Roots,—of Lower Palæozoic crinoids of Bohemia, with or without loboliths; WAAGEN & JAHN (246) pp. 189–192, pl. lxxvi, see also "*Calpiocrinus? bohemicus.*"—Of *Strophocr.* compared with *Lichenocr.*, "the root of crinoids appears to be the counterpart of the calyx in type of symmetry"; SARDESON (207) p. 275.

6. Hydrocoel, &c.:—Stone-canal,—development in *Antedon* compared with position in *Cystidea*; JAEKEL (130) p. 102.

7–9. Vacant.

10. Mesodermal tissues, joints:—Distribution of syzygies in *Actinometra paucicirra*; DOEDERLEIN (77) p. 479.

11 & *12.* Vacant.

g. *CYSTIDEA.*

1–3. Vacant.

4. Skeletal tissue or Stereom:—Detailed discussion of, in *Cystidea* (Jkl.); JAEKEL (130) p. 70.

5. Skeleton:—Body form and anatomy of skeleton discussed in detail for *Cystidea* (Jkl.); JAEKEL (130) pp. 67 et sqq., 79, 346. —Skeleton of *Thecoidea* (=*Edrioasteroidea*) fully discussed; JAEKEL (130) pp. 11 et sqq.

"Pores" of *Cystidea*, "Pectini-rhombs" of *Cystidea Rhombifera*, their origin, evolution, and meaning; BATHER (22) p. 917. —Thecal pores of *Cystidea* (Jkl.); JAEKEL (130) pp. 104–124, 184, 358.

'Vectacula,' new term for subvective grooves, i.e. ciliated food-grooves of *Pelmatozoa* (p. 13, footnote): "Hydrophores palmées" not found in *Pyrocystis* (p. 417), nor in *Aristocystis* (p. 411): Brachioles exist in *Aristocystis* (p. 411): 'Dactyli' 'fingers,' new term for brachiola of *Cystidea* (Jkl.) pp. 87, 355; JAEKEL (130).—Ambulacra of *Mesites* [=*Mesocystis*] discussed; SOLLAS (216) p. 706.

Stem of *Glyptosphaera* discussed (p. 423), Loss of stem in *Protocrinus* (p. 431); JAEKEL (130).

6. Hydrocoel, &c.:—Ambulacral system, its structure inferred in *Cystidea* (Jkl.) (pp. 79, 187, 351), and in *Thecoidea* (=*Edrioasteroidea*) (p. 12), Stone-canal of *Cystidea* (Jkl.) (pp. 98, 190, 362); JAEKEL (130).

7. Coelom:—Of *Cystidea* (Jkl.) and course of mesenterics; JAEKEL (130) pp. 124, 364.

8. Digestive system:—Course of gut in *Cystidea* (Jkl.) (pp. 127–137, 188, 364), in *Thecoidea* (=*Edrioasteroidea*), its coiling, connected with curvature of subvective grooves (p. 22); JAEKEL (130).

9. Nervous System:—Of *Cystidea* (Jkl.) (p. 143), of *Thecoidea* (=*Edrioasteroidea*) inferred (p. 25); JAEKEL (130).

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10. Mesodermal tissues, joints:—Muscle system of *Cystidea* (Jkl.) (p. 144), of *Thecoidea* (= *Edrioasteroidea*) inferred (p. 24); JAEKEL (130).
11. Vacant.
12. Genital system:—Of *Thecoidea* (= *Edrioasteroidea*) inferred (p. 25), parietal pore [gonopore] and genital organs of *Cystidea* (Jkl.) (pp. 137–143, 190, 363); JAEKEL (130).

h. *BLASTOIDEA.*
1–4. Vacant.
5. Skeleton:—'Dactyli' 'fingers,' new term for brachiola; JAEKEL (130) p. 87.
6–12. Vacant.

ii. **Variation**:—

a. In form:—Vacant.

b. In form and surface characters:—Local races of *Asterias forbesi* and *A. vulgaris*; MEAD (174) pp. 39, 42.—In proportions, marginals, and spines of *Goniaster americanus*; VERRILL (243) p. 153.—In arm-length of *Ctenodiscus corniculatus*, *Solaster endeca*, *Cribrella oculata*, *Asterina linckii* (p. 339), in dorsal skeleton of *Solaster papposus* (p. 338); DOEDERLEIN (78).—In spines and radial scutes of *Ophioglypha lymani*, spines of dorsal disc of *Ophiactis asperula*; LUDWIG (157) pp. 5, 6.—In proportions and form of oral shields, and number and arrangement of adjacent angular plates, in *Ophiura pallida* (p. 11), in spines of *Ophiothrix angulata* (p. 19) and minor points in various spp., passim; VERRILL (244).—Study of variations in *Scyphocrinus*; WAAGEN & JAHN (246) pp. 63, 74.

c. In colour:—In life and alcohol, of various Holothurians; BEDFORD (28).—Spotted and striped *Synapta beseli*; BEDFORD (28) p. 142.—Colour of *Synapta roseola* and *S. inhaerens*, normal pink of former perhaps due to excess of iron, not protective; CLARK (57) p. 24, 27, coloured pl. x.—Colour of *Holothuria surinamensis* (p. 122), of *Cucumaria punctata* (p. 124) and of Bermuda Echinoderms generally (pp. 130–134): local variation *Echinometra subangularis* N. and S. of Bermuda, *Mellita sexforis* Bermuda and Jamaica, *Luidia clathrata* Bermuda (pp. 117, 118); CLARK (56).—Under surface of *Hymenaster regalis* var. *agassizi* deep pink or rose-colour in alcohol, upper side paler pink; VERRILL (243) p. 221.—Colour in life of *Asterina cepheus* (p. 541), *Linckia ehrenbergii*, *L. multifora* (p. 542), *Ophiarthrum elegans* (p. 547); LUDWIG (158).—Colour of various *Ast.* and *Oph.* in spirit; BIDENKAP (37 and 38).—Local colour varr. of *Ophiura brevispina* (p. 5): colour of *Ophiura rubicunda* (p. 6), *O. appressa* (p. 7), *O. pallida* (p. 7), *Ophiopaepale goesiana* (p. 8), *Ophiothrix angulata* (p. 19), *O. oerstedi* (p. 20), *O. suensoni* (p. 21), *Ophiactis dispar* (p. 32), *Ophiopristis hirsuta* (p. 51), *O. lineolata* (p. 54), *Amphipsila maculata* (p. 57), *Ophiomyxa flaccida* (p. 66), *Ophioplus tuberculosus* (p. 72), *Astrophyton muricatum* (p. 84) and *Gorgonocephalus mucronatus* (p. 85); VERRILL (244).—Colour in life of *Ophiactis asperula* (p. 7), *Amphiura chilensis* (p. 12), in spirit of *Ophiocten amitinum* (p. 5); LUDWIG (157).—Colour of spp. of *Antedon* and *Actinometra*; DOEDERLEIN (77).—*Pentacr. wyvillethomsoni*, bluish-green in life; ALBERT, Prince de MONACO (5) p. 313.

d. Meristic variation:—
1. Variation from pentamerous symmetry:—Loss of anterior ambulacrum, and diminution of the two anterior interambulacra, combined with normal peristome, in *Scutella faujasi*; KERFORNE (134).—In *Ast.*, general account; HAMANN (118)

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p. 737.—4-rayed and 6-rayed *Odontaster hispidus* (p. 207), *Plutonaster agassizi* (p. 211); VERRILL (243).—6-rayed *Linckia ehrenbergi* (p. 542), *Ophiactis savignyi* (p. 545); LUDWIG (158).—6-rayed *Ophiocoma pumila*; CLARK (56), p. 118.—6-rayed *Ophiothrix galapagensis*; LÜTKEN & MORTENSEN (162) p. 182.—6-rayed *Astroschema oligactes*; VERRILL (244) p. 77.—*Hemicosmites laevior*, 7 instead of 6 infralaterals; JAEKEL (130) p. 309.

2. Reduplication or absence of parts:—in number of Polian vesicles and stone-canals, presence or absence of Cuvierian organs, in *Holothuria atra* (p. 147), and *H. cinerascens* (p. 148), of Polian vesicles in *Synapta ooplax* (p. 141); BEDFORD (28).—In number and symmetry of tentacles in *Pseudocucumis africana*, compared with normal condition of other spp.; BEDFORD (29) p. 843.—In number of tentacles and Polian vesicles in *Holothuria surinamensis* (p. 122), of Polian vesicles in *Cucumaria punctata* (p. 123); CLARK (56).—In columns of interambulacrals in *Melonites* and *Oligoporus*, fewer being comparable with phyloneanic, and more with phylogerontic, character; JACKSON (127).—Accessory madreporite, not connected with stone-canal, in *Asterias*; MEAD (174) p. 73.—2 interradial marginals in one axial angle of a specimen of *Benthopecten spinosus* in place of 1; VERRILL (243) p. 218, pl. XXX.—Arm of *Actinocr. porteri* "divides into 3 branches at once, at the thirteenth joint" [apparently due to regeneration]; WHIDBORNE (250) p. 221.

c. Abnormalities:—Accessory pores in genitals of *Arbacia* and *Strongylocentrotus* "a monstrosity...parallel to the normal feature of" certain palæozoic *Ech.*; JACKSON (127) p. 131.—In *Ast.*, general account; HAMANN (118) p. 737.—Irregular mouth-shields in *Amphiura assimilis*; LÜTKEN & MORTENSEN (162) p. 154.—Hypertrophy of one half in *Gorgonocephalus diomedeæ*; LÜTKEN & MORTENSEN (162) p. 188.—Abnormal cup in the type-specimen of *Laubeocr. barrandei*; WAAGEN & JAHN (246) p. 31.—Pathological individual of *Hemicosmites pyriformis* with elevated anus; JAEKEL (130) p. 309.

iii. **Secondary Sexual Characters**:—

a. Differences of Form or Structure:—Vacant.

b. Differences of Colour:—Vacant. (See under II, B, ii, c.)

c. Protection of Young:—In *Ast.*, general account; HAMANN (118) p. 627.—In *Oph.*, list of viviparous spp.; LUDWIG (159) p. 230.—Brood-chamber and parturition in *Pteraster hexactis*; DOEDERLEIN (78) p. 338.

(C.) PHYSIOLOGY.

i. **General**:—Account of *Ast.*; HAMANN (118) pp. 724–735.

ii. **Circulation**:—Fluid in respiratory trees of *Holothuria* and *Stichopus*, affords support for muscular action; BORDAS (43).

iii. **Respiration**:—Osmosis, respiratory trees, *Holothuria* and *Stichopus*; BORDAS (43).—Respiration as function of thecal pores in *Cyst.*; JAEKEL (130) p. 120.

iv. **Alimentation and Digestion**:—Vacant.

v. **Excretion**:—Uric acid and urates in respiratory trees of *Holothuria* and *Stichopus*; BORDAS (43).—By ciliated funnels and phagocytes combined in *Synapta*; CLARK (57) p. 29.—By amoebocytes in Echino-

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derma compared with that in Mollusca; its imperfection; CUÉNOT (65) p. 87.

vi. **Sensation**:—Reflex and coordinated responses of the *Ech.* spine; UEXKÜLL (235).—Action of pedicellariae in *Ech.*, immunity of same individual or species ascribed to a principle—'autodermin'; UEXKÜLL (234).—Sense of smell in *Synapta*, otocysts as equilibrating "positional organs," not auditory (p. 28), coordination of tentacles and muscles survives cutting of nerve-ring (p. 30); CLARK (57).—Experimental investigation of nervous system in Echinoderma, for determination of coordinating centres as stages in evolution of brain; STEINER (222).—Movements of various Echinoderms ascribed to stereotropism, geotropism, and heliotropism, not to consciousness; LOEB (152 A).

vii. **Miscellanea and Experimental Physiology**:—Amoebocyte formation in parietal lacunae of respiratory trees of *Holothuria* and *Stichopus*; BORDAS (43).—Tonus of Holothurian muscles lost by warmth, increased by cold, the limits of the observation being 6—38° C.; SCHOENLEIN (210).—The hardening of the Holothurian skin in response to stimuli, and its softening into a slime under other conditions, especially death, chemically and microscopically examined in spp. of *Holothuria*, *Stichopus*, *Cucumaria*, *Synapta*, and found to be due to the inhibition or excitation by the cellular elements of a histolytic tendency in the intercellular substance; LINDEMANN (146).—Temperature (+) at which *Echinus microtuberculatus*, *Strongylocentrotus lividus*, and embryos of latter are killed; VERNON (241).—Pedicellariae of *Asterias* grasp fine threads and can support weight of animal; MEAD (174) p. 74.—Madreporite not essential to life of *Asterias*, at least for 5 months; MEAD (174) p. 73.—Experiments on otocysts (see vi), ciliated funnels (see v) etc. in *Synapta*; CLARK (57).

(D.) BIONOMICS.

i. **General Accounts**:—Habitat, bathymetric distribution, etc. of the various recent Classes, from a palæontological point of view; GRABAU (107) pp. 345–348.—Habits of larvae, young, and adult *Asterias*; MEAD (174) pp. 50, 53.

ii. **Special habits**:—Social habit of *Ech.* and *Ast.*; SEMON (213) p. 505.—Phosphorescence,—in *Ophiopsila annulosa*; LO BIANCO (147) p. 472. See also NUTTING (184, 185).

iii. **Habitat**:—Of *Hol.*, *Ech.*, *Ast.* and *Oph.* in English Channel; ALLEN (8) pp. 460–476.—Of *Hol.*, *Ech.*, *Ast.*, *Oph.* in Lyngenfjord and Tromsö Sound; BIDENKAP (37, 38) *passim*.—Of *Hol.*, *Ech.*, *Ast.*, *Oph.* and *Crin.* in Bay of Naples; LO BIANCO (147), pp. 469–476.—Of Bermuda *Hol.* (*passim*) esp. *Synapta vivipara* under a stone in tideway (p. 125); CLARK (56).—Of *Synapta inhaerens*, sand and mud, *S. roseola* under stones or in gravel; CLARK (57) pp. 24, 25, 27.—Of *Echinometra lucunter*, which bores channels in Suva coral-reefs; AGASSIZ (1) p. 118, pl. XXX.—Of *Ast.* in general; HAMANN (118) p. 735.—Of *Ophionereis reticulata*, in bunches partially buried in the sand, and of *Luidia clathrata*, partly buried in sand; CLARK (56) p. 118.—Of *Oph.* at Bahamas, esp. on hard bottom and on corals; VERRILL (244) p. 2 and *passim*.—Colony of *Cyathidium holopus* with all individuals bent in same direction, probably to meet some constant current, orientation as yet unknown; HENNIG (119) p. 116.—Unstalked *Protocrinus* sessile on limestone floor, cf. *Marsupites* and *Uintacrinus*; JAEKEL (130) p. 431.—Mode of life and habitat of *Thecoidea* (=*Edrioasteroidea*); JAEKEL (130) p. 26.

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iv. **Feeding**:—Food of *Hol.*, *Ech.*, *Ast.*, *Oph.* found in English Channel; Allen (8) pp. 460–476.—Use of pedicellariæ in *Ech.* for feeding; Uexküll (234) p. 396.—Feeding of *Ast.*; Hamann (118) p. 732.—Food of *Asterias*, and method of feeding; Mead (174) pp. 42, 56; Field (86) p. 154, pl. i.—Food of *Astropecten* (p. 471), *Oph.* obtain food by settling near the food-currents of sedentary organisms (p. 472); Lo Bianco (147).

v. **Defence and Protection**:—

a. b. c.—of *Ast.*, short account; Hamann (118) p. 736.—Modes of protection against molluscs; Semon (213) p. 509.

a. Active:—Cuvierian organs as weapons of defence; Russo (203).—Pedicellariae in *Ech.* distinguished as 'poison-tongs'=gemmiform, 'snap-tongs'=tridactyle, 'grip-tongs'=ophicephalous, and 'cleaning-tongs'=trifoliate, their action described and the poison investigated, from observations on *Echinus acutus*, *E. melo*, *E. microtuberculatis* [sic], *Sphaerechinus granularis* and *Strongylocentrotus lividus*, also pedicellarjae of *Ast.*; Uexküll (234).

b. Concealment:—Vacant.

c. Protective Coloration:—*Oph.* with coiled arms imitate form and colour of gorgonian corals on which they live; Verrill (244) p. 2.—The brilliant colours of deep-sea echinoderms and other animals may be rendered visible by phosphorescent light, and therefore may be protective; Nutting (184).—Phosphorescence in an Ophiurid, perhaps protective; Nutting (185) p. 795.

vi. **Locomotion**:—Of *Hol.*, *Ech.*, *Ast.*, *Oph.* found in English Channel; Allen (8) pp. 460–476.—Of *Synapta*, by body-wall and anchors, and by tentacles; Clark (57) pp. 25–28.—Of *Ast.* general account; Hamann (118) pp. 728–730.—*Asterias* crawls over greasy surfaces and in a very thin layer of water, but not out of water (p. 40), rate and distance of migration (p. 41); Mead (174).

vii. **Autotomy and Regeneration**:—In *Synapta inhaerens* and *roseola*, never normal (p. 25), part cut off from head never lives (p. 30); Clark (57).—General account of schizogony and regeneration in *Ast.* (pp. 655, 656) and of autotomy (p. 727), addendum (p. 743); Hamann (118).—Effect of mutilation on rate of growth of both original and regenerated parts in *Asterias* (p. 63), experimental study, arms regenerated by disc, but disc never regenerated by arms, multiplication of individuals by artificial fission highly improbable and never observed (p. 69); Mead (174).—Fissiparity in *Asterias tenuispina* (p. 470); Lo Bianco (147).—Regeneration, *Linckia ehrenbergi* (p. 542), *Ophiactis savignyi* (p. 545); Ludwig (158).—Arm of *Actinocr. porteri*, see II, B, ii, d, 2; Whidborne (250) p. 221.

viii. **Parasites and Commensals**:—*Myzostoma*, species on *Antedon phalangium* and *A. rosacea* (p. 468), *Acholoë astericola* and *Ophiodromus flexuosus* in ambulacral groove of *Luidia ciliaris* (p. 471), *Ophiothrix* on sponges or ascidians so as to benefit by their food-currents (p. 472), *Alepas minuta*, *Scalpellum vulgare* and *Perigonimus cidaridis* (p. 473), *Fierasfer* in *Holothuria* and *Stichopus* (p. 476); Lo Bianco (147).—*Eulima* attached to external surface and in buccal cavity of *Holothuria vagabunda*; Bedford (28) p. 146.—*Fierasfer homei* in *Stichopus chloronotus*; Bedford (28) p. 150.—Ova and embryos of a Gastropod, ?parasitic, found "in the usual mucoid (?) capsules" of *Pseudocucumis africana*; Bedford (29) p. 845.—*Phyllacanthus annulifera*, spines quite covered with an incrusting Zoanthid; Bell (32) p. 134.—*Arete dorsalis*, an Alpheid, lives on oral region of *Echinometra lucunter* on madreporic reefs at Djibouti; Coutière (62)

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p. 370, and (63) pp. 509, 510.—Polynoid *Acholoë astericola* in groove of *Astropecten irregularis* (p. 462) and mollusc *Montacuta substriata* on spines of *Spatangus purpureus* (p. 475); ALLEN (8).—*Protozoa*, worms, *Mollusca*, *Myzostomidae*, *Crustacea*, *Vertebrata*, as parasites of *Ast.*; HAMANN (118) p. 738.—Resistance of *Asterias* to parasites; MEAD (174) p. 68.—*Monilopora beecheri* and *M. antiqua*, corals, on stems of erect *Platycr.* and other *Crin.*, in Keokuk and Hamilton strata, like *M. crassa* in British Carboniferous Limestone; GRABAU (109) pp. 412, 413, pl. i.—*Capulus* (*Orthonychia*) on tegmen of *Actinocr. porteri*; WHIDBORNE (250) p. 221.

ix. **Echinoderms as Food**:—Gonads of *Ast.* and *Hol.* are even more palatable than those of *Strongylocentrotus lividus*, and should be eaten; BORDAS (44) p. 195.—*Ech.* gonads canned and exported from California to China as food; KELLOGG (133) p. 263.

As food for mollusca, which decalcify them by secretion of sulphuric acid; SEMON (213) p. 509.—Natural enemies of *Asterias* in Narragansett Bay; MEAD (174) p. 68.

As food for fish,—*Ophiocten*, *Ophiura*, *Strongylocentrotus*, *Solaster*, *Cribrella*, *Stichopus*, *Phyllophorus*, and other echinoderms in Cod (*Gadus callarias*) and Haddock (*G. aeglefinus*); NORDGAARD (181) pp. 15–18.

x. **Echinoderms as Rock-formers**:—Cystid and Crinoid limestones of Ordovician, Devonian, Carboniferous, and Permo-Carboniferous age, from China; LOERENTHEY in LÓCZY (149) pp. 242–258.—Petit Granite de Soignies et des Ecaussines, formed of *Crin.*; GOSSELET (106) p. 53.—*Crin.* columnals spathose though dolomitised, in a crinoid limestone; STELLA (224) pp. 155–160.

(E.) MISCELLANEOUS.

i. **Research and Instruction**:—

a. Preservation:—Of ova of Echinoderms for microscopic examination; MORGAN (178) p. 459.—Echinoderms; LO BIANCO (148) pp. 27–29.—Of *Hol.* for histology; BORDAS (44) p. 195.—Killing and preservation of *Synapta*; CLARK (57) p. 25.—Formaline destroys spicules, Echinoderms to be preserved in spirits; THILENIUS (228).

b. Methods of research:—Staining Echinoderm ova during life; FISCHEL (88).—Preparation of spicules of *Hol.*; TEMPÈRE (227).—The development of columnals by acid in a crinoid limestone; STELLA (224) p. 155.—Investigation of *Crin.* and *Ast.* in Bundenbach slates of Devonian age by X-rays; BRÜHL (48) p. 549.

c. Museum Exhibits and Collections:—Exhibition of recent Echinoderms at British Museum; ANON (17).—List of specimens of fossil *Ast.*, *Crin.* and *Blast.* figd. or descr. by R. P. Whitfield, with present location, exc. those in Amer. Mus. Nat. Hist.; WHITFIELD (253) pp. 147, 148.—List of historical specimens of Silurian *Ast.*, *Crin.*, *Cyst.* in Amer. Mus. Nat. Hist.; WHITFIELD & HOVEY (254) pp. 88, 89.—Museum Comp. Zool. Harvard, large slab of *Uintacr.*; WOODWORTH (258) p. 5, pl.—List of Blastoidea in British Museum; BATHER (26).

d. Instruction:—Notes and diagrams for help of students; SELENKA (211).—Popular account of dissection of *Strongylocentrotus lividus* and *Asteracanthion rubens*; GRUVEL (113).—Practical course in study of cell and fertilization with examples from *Ech.* ova and hybrid larvae; HAECKER (116).

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ii. **Economics**:—Figures of various Echinoderms for the edification of designers; HAECKEL (115).—Trepang fishery; SEMON (213) p. 309.—Increase of *Ast.* on oyster beds due to capture of surface-feeding fish; EDITORIAL AMER. NATURAL. (81).—Investigation of *Asterias* with reference to attacks on oyster beds and clams, modes of protection; MEAD (174).—*Asterias forbesi* as destroyer of oysters, how to check it, value as manure; FIELD (86). See also under II, D, ix.

iii. **Bibliography**:—Literature of Echinoderma for 1898, with abstracts; LUDWIG (161).

Chiefly of Atlantic *Ast.*, with special list of Verrill's papers on *Ast.*; VERRILL (243) p. 224.—Of *Oph.*, systematic, subsequent to Lyman's Monograph of 1882; LÜTKEN & MORTENSEN (162) pp. 195–205.—Of Antarctic *Oph.*; LUDWIG (157) p. 27.—Of Antarctic *Crin.*; LUDWIG (156).—Of 1896 papers on Experimental Embryology; ENDRES (82).

Of fossil *Crin.* of Normandy; BIGOT (39) p. 71.—Of N. American Carboniferous Invertebrates, with list of Echinoderm genera on pp. 43, 44, and alphabetical index to spp.; WELLER (249).—Palæozoic Echinoderms of Indiana, uncritical list of spp., with annotated list of literature; KINDLE (136) pp. 422–439 and 489.—Of Spanish fossils, with list of spp. [vide sub III, B]; MALLADA (167).—Echinoderm fossils mentioned in Bassi's "Tabella Oryctographica" 1757, s.v. "Crustacea," now determined from the originals in Geological Institute of Bologna; VINASSA DE REGNY (245) p. 493.

List of published writings by J. Hall; HOVEY (124), STEVENSON (225).—List of palæontological writings by A. Pomel, with remarks; FICHEUR (85) pp. 215, 221.—List of published scientific writings of C. Wachsmuth; BATHER (25).—The date of Barrande's Cystid works; JAEKEL (130) p. 59, footnote.—Dates of publication of parts of Paléontologie Française; SHERBORN (214).

iv. **Historical, Popular notions, &c.**:—History of Echinoderm palæontology, with critical appreciations; ZITTEL (261) pp. 185, 186, 805–810.—History of discovery and study of Egyptian *Ech.*; FOURTAU (96) p. 609.—Spines of *Cidaris glandaria* mentioned by Egyptians under XXVI Dynasty, and in other writings of antiquity; FOURTAU (96) p. 613.—History of opinion and literature concerning pedicellariae; UEXKÜLL (234) pp. 337–354.—General history of the Taxonomy of *Ast.*; HAMANN (118) pp. 657–666.—History of knowledge of *Cystidea*; JAEKEL (130) pp. 55–63.

(F.) AUXOLOGY.

i. **General Principles**:—Suppression or addition of interambulacrals in palæozoic *Ech.* due respectively to retardation or acceleration of development (p. 131); "Throughout the life of the individual, stages may be found in localized parts, which are similar to stages found in the young, and the equivalents of which are to be sought in the adults of ancestral groups. The equivalents of regressive or progressive localized stages are to be sought in the adults of degradational or progressive series of the group"; illustrations from *Ech.* and *Crin.*: JACKSON (127).

ii. **General Accounts**:—Vacant.

iii. **Formation of Gonads**:—In *Holothuria tubulosa* and *H. impatiens*; BORDAS (44) p. 198.—"A special structure or apical body at the anterior tip of the head...in more than 40 species" of Invertebrates "including *Toxopneustes*"; FIELD (87).—Alveolar structure of

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cytoplasm in ova of *Toxopneustes*, *Arbacia*, *Echinarachnius*, *Asterias*, and *Ophiura*, and its relations to astral rays; WILSON (257).—The same for *Echinus microtuberculatus*, with general discussion; ALBRECHT (7).

iv. **Oviposition, Fertilisation, and Segmentation**:—Breeding of *Echinarachnius parma*, *Cribrella*, and *Oph.*, Wood's Holl, May 1898, and *Ophiopholis* at Nahant, May 1893; BUMPUS (49).—Breeding season: of *Synapta* at Woods Holl; CLARK (57) p. 25.—of *Asterias* in Narragansett B. and at Woods Holl; MEAD (174) pp. 44, 48.—of *Hol.*, *Ech.*, *Ast.*, *Oph.*, *Crin.*, in Gulf of Naples; LO BIANCO (147) pp. 469–476.—on W. coast of Sweden; AURIVILLIUS (21) pp. 11–16.—of *Luidia sarsi*; NORDGAARD (181) p. 20.—Spawning of *Ast.* in general; HAMANN (118) p. 626.—*Oph.* spawn in afternoon as a rule; GRAVE (110) p. 93.—Migration from deep to shallow water at breeding period, *Asterias*, *Asthenosoma*; SEMON (213) p. 507.

Hol. ova, Falmouth, November and December; VALLENTIN (238) p. 535.—Maturation and fertilisation of ova in *Ast.*; HAMANN (118) p. 628.—Ova of *Ophiura olivacea*, appearance and fertilisation; GRAVE (110) p. 93.

Segmentation of ova studied by staining during life; FISCHEL (88).—Discussion of FISCHEL, on basis of foam-structure of protoplasm; RHUMBLER (197 A).—Astrosphere in immature ova of *Echinus microtuberculatus* and *Sphaerechinus granularis*; STRICHT (225 A).

v. **Larval Stages**:—

a. Plutei at Falmouth in September; VALLENTIN (238) p. 535.

b. Larval stages of a Holothurian, popular account; ROULE (201) p. 127 and text-figg.

c. Larval stages of *Ech.*, popular note; ROULE (201) p. 127.—Early development and description of plutei of *Echinus esculentus* and *E. miliaris*, with figures; MACBRIDE (166).

d. General account of larval development in *Ast.*; HAMANN (118) pp. 628–645.—Habits of *Asterias* larva; MEAD (174) p. 50.—*Bipinnaria asterigera* in Puddefjord in November; NORDGAARD (182) p. 14.—Goto's account of development of *Asterias pallida* [(81) Zool. Rec. 1898] criticised with special reference to primitive segmentation of coelom, right hydrocoel, fixation by preoral lobe, and absence of secondarily formed spaces in mesenchyme, all which statements are reaffirmed by MACBRIDE (164).

e. Early development of *Ophiura olivacea*, corroboration of Goto's conclusions from *Asterias pallida*; GRAVE (110).

f, g, h. Vacant.

vi. **Organogeny**:—

a. *Echinoderma*:—

12. Sexual cells differentiated from peritoneal lining of cœlom as cellular cords [rachis] in all *Echinoderma*, but since *Crin.* have primitively a single rachis they, with *Hol.*, are *Monorchonia*, while *Ech.*, *Ast.*, *Oph.* are *Pentorchonia*; RUSSO (204).

b. *Holothurioidea*:—

8. Development of Cuvierian organs; RUSSO (203).

c. *Echinoidea*:—Vacant.

d. *Asteroidea*:—

1. General account of organogeny; HAMANN (118) pp. 646–655.

2. Plane of larva and adult in *Asterias pallida*; MACBRIDE (164) p. 49.

6. Origin and meaning of the hydrocoel; MACBRIDE (165) p. 143.—Right hydrocoel in *Asterias pallida*; MACBRIDE (164) p. 49.

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7. Alleged schizocoels in mesenchyme of *Asterias pallida*; MacBride (164) p. 50.

e. *Ophiuroidea*:—Vacant.

f. *Crinoidea*:—

12. Origin and relations to aboral [?axial] sinus and axial organ of genital rachis in *Antedon*; Russo (204).

g, h. Vacant.

vii. **Post-larval Growth-stages**:—

b. *Holothurioidea*:—Difference in colour between young and adult *Synapta godeffroyi*; Bedford (29) p. 847.

c. *Echinoidea*:—Differences of form and apical system according to age in *Hemiaster cubicus*; Fourtau (96) p. 628.—Addition and development of interambulacrals in *Strongylocentrotus*, *Arbacia*, *Melonites*, and *Oligoporus* (pp. 129–131, figg. 110–116), non-imbrication of morpho-brephic interambulacrals in *Lepidechinus* proves simplicity of all interambulacrals in ancestor (p. 132); Jackson (127).

d. *Asteroidea*:—Rate of growth of *Asterias* up to sexual maturity (pp. 58, 66), brephic *Asterias* on sea-weed in Narragansett B. (p. 47); Mead (174).—Neanic *Astropecten zebra*; Loriol (154) p. 9.

e. *Ophiuroidea*:—Study of post-larval growth-stages in *Ophiactis asperula* and comparison with other *Ophiolepididæ* and *Amphiuridæ*, also in *Ophiactis kröyeri*, *Amphiura magellanica*, *A. patagonica*, and *Ophiacantha vivipara*; Ludwig (159).—Young stages of *Oph.* compared with *Ophiotypa simplex*; Koehler (142) p. 3.—Brephic *Ophiothrix angulata* (pp. 19, 20), brephic and neanic *Astrogomphus vallatus* (p. 81), neanic *Astrophyton muricatum* (p. 84); Verrill (244).—Neanic *Amphiura eugeniæ*, *A. patagonica*, *A. chilensis*, differences from adult; Ludwig (157) pp. 9, 11, 12.—Young specimens of *Ophioglypha tumulosa* (p. 122), *O. plana* (p. 124), *O. divisa* (p. 129), *Ophiomusium glabrum* (p. 134), *O. diomedeæ* (p. 135), *O. lymani* (p. 139), *Amphiura diomedeæ* (152), *Ophiacantha inconspicua* (p. 169), *Asteronyx excavata* (p. 186); Lütken & Mortensen (162).

f. *Crinoidea*:—Neanic *Actinometra belli*, brachia; Doederlein (77) p. 479.—Pentagonal and cirriferous morpho-brephic columnals in *Metacr. rotundus* and *Pentacr.* (*Isocr.*) *decorus* correlated with morphephebic characters of [alleged] "ancient fossil representatives," e.g. *Pentacr.* (*Extracr.*) *briareus*: morphephebic columnals of *Platycr.* are circular, as were all columnals of ancestor: morpho-brephic brachials of *Encrinus* are uniserial, but morphephebic are biserial; Jackson (127) pp. 127, 128, figg. 124–127.

g. *Cystidea*:—Young stages of *Thecoidea* (= *Edrioasteroidea*); Jaekel (130) p. 28.

viii. **Developmental mechanics and Experimental Embryology**:—Summary of 1896 papers; Endres (82).

General discussion of segmentation and early organogeny in Echinoderma from fragmentary or other ova and blastulæ; Driesch (79).—No interaction between first two blastomeres, but number of blastulæ derived from a single ovum depends on the geometrical form impressed on the protoplasm, as experimentally shown in *Ech.* ovum; Loeb (151).—Merogonic fertilisation and hybridisation of ova of *Echinus*, *Strongylocentrotus*, and *Sphaerechinus*, with discussion of conclusions; Delage (67).—Discussion of Boveri and Delage; Giard (104) pp. 663–665.—Criticism of Delage's conclusions as to merogony (see 43, Zool. Rec. 1898, and 67, this Record); Giard (103).—'Ovulase,' i.e. extract of spermatozoa of *Strongylocentrotus lividus* and

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Echinus esculentus by agitation and filtration, induces segmentation in ripe ova [of same spp.?]; PIÉRI (190).—Parthenogenesis in *Ech.* (*Arbacia*),—"mixture of about 50 % $\frac{1}{8}$ *n* $MgCl_2$ with about 50 % of sea water was able to bring about the same effect as the entrance of a spermatozoon," viz. segmentation and formation of normal plutei; LOEB (152).—Development and growth of *Ech.* larvæ hastened by weak alkali (NaHO) checked by weak acid (HCl); LOEB (150) [cf. 132 Zool. Rec. 1898].—Effect of solutions of Sodium and Magnesium chloride on fertilized and unfertilized ova of *Arbacia punctulata*, *Sphaerechinus*, *Echinarachnius parma*, *Asterias forbesi*, and other animals, criticism of Loeb; MORGAN (178).

Hybrid larvæ,—stale ova of *Sphaerechinus granularis* × fresh sperm of *Strongylocentrotus lividus* (p. 359), effect of staleness of gonads (in *Strongylocentrotus lividus*) on development; with relative staleness of ♂ and ♀; VERNON (240).—Hybridisation; DELAGE (67).

Action of excess of carbon dioxide in sea-water on skeletogeny in *Ech.* larvæ; DRIESCH (80).—Effects of various stains on developing ova of *Echinus microtuberculatus* and *Sphaerechinus granularis*; FISCHEL (88).

III. DISTRIBUTION.

A. GEOGRAPHICAL.

i. **General**:—Migration of Echinoderms in larval state; BATHER (27) pp. 270, 271.—Distribution of *Ast.*, horizontal and vertical; HAMANN (118) pp. 720–723.—Bathymetric of recent Classes; GRABAU (107) pp. 345–348.

Discussion of Ludwig's reports on *Hol.*, *Crin.* and *Oph.* of Hamburger Magalhaensische Sammelreise, with reference to Bipolar hypothesis; ORTMANN (187).—Discussion of *Hol.*, *Ech.*, *Ast.*, *Oph.*, *Crin.* spp. which have been adduced in support of the Bipolar hypothesis, and rejection of the latter; THOMPSON (230) esp. pp. 317–322.

ii. **Atlantic Ocean and adjacent Seas**:—Various localities, *Hol.* dredged by 'Travailleur' and 'Talisman'; R. PERRIER (191).

Scandinavia:—Norway. Puddefjord near Bergen, *Bipinnaria asterigera*; NORDGAARD (182) p. 14.—Tromsö Sound, *Hol.*, *Ech.*, *Ast.*, *Oph.*; BIDENKAP (38).—Storfjord, the S.W. branch of Lyngenfjord, *Ech.*, *Ast.*, *Oph.*, incl. *Asterias stellionura*, large *Henricia sanguinolenta*; BIDENKAP (37) pp. 84, 85, 99.—Öresund,—general absence of Echinoderms from S. portion and Lommabugt, but *Asterias rubens* between Sjollen and Malmö; LÖNNBERG (153) p. 17: geographical affinities of Echinoderm fauna; BATHER (27) pp. 267, 269.

British Coasts:—Irish Sea, Port Erin, dredgings of *Ech.*, *Ast.*, and *Oph.*; CHADWICK (55).—English Channel, Thirty fathom line from Eddystone to Start Point, lists of Echinoderms, with character of bottom, associated species, and comparative distribution; ALLEN (8) pp. 390–439 passim, 460–476, 530, 536, and charts v-ix.—Falmouth, plutei and *Hol.* ova; VALLENTIN (238) p. 535.—Devon, Salcombe B., *Ophiocnida brachiata*; NORMAN (183) p. 289.

From B. of Biscay to Azores and Western Mediterranean, *Hol.* dredged by 'Princesse Alice,' with n. spp. of *Stichopus*, *Psychropotes*, and *Scotoplanes*; HÉROUARD (120).—ditto, *Kolga* and *Scotoanassa*; HÉROUARD (121).—New Madeira, 1425 metres, *Pentacr. wyville-thomsoni*; ALBERT, Prince de MONACO (5) p. 313.

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Mediterranean:—the spp. of *Echinocardium* found in Mediterranean, and their distribution; KOEHLER.—Adriatic and Ionian seas, June to September, *Ech.*, *Ast.*, *Oph.*, *Hol.*; CONDORELLI (61).

American coast:—n. spp. of *Tosia*, *Peltaster*, *Hippasteria*, *Cladaster*, *Mediaster*, *Pseudarchaster*, *Odontaster*, *Prionaster*, *Sideriaster*, *Marginaster*, and distributional notes on other *Ast.* spp.; VERRILL (243).—Geogr. and bathymetric range of *Asterias forbesi* and *A. vulgaris*, with special reference to Narragansett B. and Buzzards B.; MEAD (174) p. 38.—Narragansett Bay—distribution of animals, esp. *Ast.*; SOUTHWICK (218): of starfish, breeding area; SOUTHWICK (219).—Antilles, common *Ech.*, *Oph.*, *Ast.*; SONTHONNAX (217).—Cuba, *Ech.*, *Ast.*, *Oph.*, *Crin.*; ARANGO Y MOLINA (19).—Bermuda, *Hol.*, *Ech.*, *Ast.*, *Oph.* collected 1898, esp. *Luidia clathrata*, *Holothuria captiva*, *Chiridota rotifera*, *Synapta inhaerens*, *S. roseola*, and *S. acanthia* n. sp.; CLARK (56).—Bahamas and W. Indies, *Oph.* coll. by Univ. of Iowa Exped. in 1893, under Nutting; VERRILL (244).—Mexico, *Astropecten rubidus* n. sp.; LORIOL (154) p. 16 [perhaps this should be III, A, iv].

iii. **Indian Ocean and adjacent Seas**:—Deep-sea (i.e. 112–1997 fms.) *Oph.* dredged by "Investigator," already noted in Zool. Rec. 1897, with addition of *Amphiura misera*, *Ophiocreas* sp. ind., more exact localities are given; KOEHLER (142).—Malacca, *Astropecten penangensis* (p. 7), Sumatra, *A. zebra* (p. 9), Mazatlan, *A. verrilli* (p. 12), Madagascar, *A. inermis* (p. 14), Pondicherry, *A. koehleri* (p. 19), Ceylon, *Scaphaster* (n. g.) *humberti*, Mauritius, *Ophiocoma doederleini*, *Gorgonocephalus robillardi*: n. spp.; LORIOL (154).—Zanzibar and neighbourhood, complete list of 127 spp. recorded, chiefly based on Voeltzkow collection, the new records being *Antedon flagellata*, *Ophidiaster pustulatus*, *Linckia ehrenbergi*, *Mithrodia clavigera*, *Ophiocoma brevipes*, *Ophiothrix otiosa*, and *Holothuria lubrica*; LUDWIG (158).—Seychelles, coral reef of Mahé Id., collected by A. Brauer: *Mulleria echinites*, *M. mauritiana*, *M. parvula*, *Holothuria monacaria*, *H. vagabunda*, *H. impatiens*, *H. pardalis*, *H. flavomaculata*, *H. cinerascens*, *Stichopus chloronotus*, *Pseudocucumis africana*, *Synapta beseli*; LUDWIG (158) p. 563.—Delagoa, *Temnopleurus*; JUNOD & GODET (131) p. 281.

Amboina and Thursday Id., spp. of *Antedon* and *Actinometra*; DOEDERLEIN (77).—East Indian Region not separable from Australian "at any rate as regards the Echinoderms and Mollusks"; FARQUHAR (84) p. 188.

iv. **Pacific Ocean and adjacent Seas**:—Eastern Pacific, fr. G. of California to G. of Panama, *Oph.* dredged by 'Albatross,' incl. n. spp. of *Ophiozona*, *Ophiernus*, *Gymnophiura* (n. g.), *Ophioglypha*, *Ophiocten*, *Ophiomusium*, *Ophiactis*, *Amphiura*, *Ophionereis*, *Ophiochiton*, *Ophiacantha*, *Ophiomitra*, *Ophiothamnus*, *Ophiothrix*, *Ophiomyxa*, *Sigsbeia*, *Asteronyx*, *Astroschema*, and *Gorgonocephalus*, also Atlantic spp. of *Ophiomusium*, *Amphiura*, *Ophiactis*, and *Ophiacantha*; LÜTKEN & MORTENSEN (162).—B. of Monterey, general character of Echinoderm fauna; KELLOGG (133) p. 633.

S. Pacific, Funafuti in Ellice Is., and Rotuma, spp. of *Hol.* collected by J. S. Gardiner, with study of comparative distribution, one possible n. sp. of *Chiridota*; BEDFORD (29).—Funafuti, *Crin.*, *Ast.*, *Oph.*, *Ech.*; BELL (33): supplementary list of Echinoderms, esp. *Metalia* and *Nardoa*; HEDLEY (118 A) p. 530.—New Britain, *Antedon indica*, *Salmacis elegans* n. sp., *Astropecten monacanthus*, *Ophiomusium simplex*, and other more common forms; Fiji, *Antedon tuberculata* (p. 133); Lifu, *Ophiomastix mixta* and other more common spp. of

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Ech., *Ast.*, and *Crin.*: BELL (32).—Loyalty Is., *Orcula dubia* n. sp. and various *Hol.*, also *Holothuria willeyi* n. sp. New Guinea; BEDFORD (28).

New Zealand, *Ophioplocus huttoni* n. sp.; FARQUHAR (84).

Japan, *Astropecten ludwigi*, *A. kagoshimensis*, n. spp.; LORIOL (154) pp. 21, 25.

v. **Arctic Ocean and adjacent Seas**:—Arctic *Crin.*, list, bathymetric distrib. etc. (see under vi); LUDWIG (156).—Arctic and subarctic *Oph.*, annotated list, with bathymetric and regional distrib., and comparison with Antarctic, 6 genera alone pass into Antarctic, and no spp., 5 spp. are circumpolar; LUDWIG (157) p. 22. Spitzbergen, *Pteraster hexactis* and *Solaster syrtensis* and other *Ast.*; DOEDERLEIN (78).—Spitzbergen and N. Norway, *Oph.*, *Ech.* esp. *Pourtalesia*, and *Crin.*, esp. *Antedon eschrichti*, 102 metres Spitzbergen, and 430 m., 80° N., and *A. phalangium*, 650 m., 65° N.; ALBERT, Prince de MONACO (6) p. 214.

vi. **Antarctic Ocean and adjacent Seas**:—Antarctic and subantarctic *Crin.*, list, bathymetric distrib., and comparison with Arctic; no bipolar sp. and no circumpolar; LUDWIG (156).—Antarctic and subantarctic *Oph.*, annotated list, with bathymetric and regional distrib., and comparison with Arctic, a parallelism in respect of families, but no bipolar or circumpolar species; LUDWIG (157) p. 17.

B. GEOLOGICAL.

(i) GENERAL.

Great value of *Echinoidea* in determining age of rocks, special value in Egypt, synchronistic table of Egyptian strata with those of Europe; FOURTAU (96) pp. 605–609, also corrections on p. 733.—*Ech.* in Tertiary of California "admirable horizon determiners"; MERRIAM (175) p. 161. —General geological history of *Ast.*; HAMANN (118) pp. 740–743.

(ii) CAINOZOIC.

a. **General**:—horizon not stated, "Gebel Haridi en face Tahta," Egypt, list of *Ech.*, also a new *Coptosoma* found near the Pyramids; FOURTAU (97).—*Ech.* found near Ghizeh; FOURTAU (98).—California, revised list and distribution of *Ech.* with *Schizaster lecontei*, n. sp. from the Martinez beds (Lower Eocene); MERRIAM (175).—Japan, *Astriclypeus integer*, *Linthia nipponica*, *Schizaster recticanalis*, n. spp.; YOSHIWARA (259).

b. **Pleistocene**:—Estuarine Clay of Magheramorne, Antrim, Ireland, fragments of *Echinus* and *Echinocardium*; BELL (31).

Leda Clay (=Champlain), of Ottawa Valley, a Spatangoid indet.; DAWSON (66).

c. **Pleiocene**:—Lombardy, annotated list of *Ech.* with n. spp. of *Brissopsis* and *Schizaster*; AIRAGHI (2).—Renault in Algeria, *Ech.* (pp. 52, 53), and general lists (pp. 84, 85); BRIVES (47).—Egypt, *Clypeaster aegyptiacus*, *Echinolampas*, *Echinocardium*; FOURTAU (96) pp. 721–723, also (98).

Lower Pleiocene, Plaisancien, "sables à Clypéastres," *Echinolampas* sp. and *Echinocardium* sp. nondescr.; FOURTAU (94).

Mexico, *Ech.*; AGUILERA (1 A) p. 230.—Ōji, near Tokyo, Japan, *Fibularia acuta*, n. sp.; YOSHIWARA (259).

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d. **Meiocene**:—Umbria, list of *Ech.*; Verri & Angelis d'Ossat (242) p. 259.—Muro in Majorca, spp. indett. of *Clypeaster*; Bofill y Poch (41) p. 412.—Wieliczka, Galicia, traces of *Oph. Ephipipiellum*; Łomnicki (152b); Szajnocha (226).—Spain, list of Echinoderms; Mallada (167) pp. 210–212.—Catalogue of *Ech.* from Egypt, with n. spp. of *Echinoneus*, *Echinocyamus*, *Scutella*, *Clypeaster*, *Pliolampas*, *Pericosmus*, *Brissus*, and revision of horizons and localities; Fourtau (96) pp. 692–721, also (98).

Upper Meiocene:—Bolderian of Gerresheim near Düsseldorf, *Echinus pusillus*, *Spatangus acuminatus*, *S. hofmanni*; Dewalque (74) p. 122.—Sahelian near Perrégaux in Algeria, *Ech.*; Brives (47) pp. 61, 82.—Tortonian of Montjuich in Spain, *Ech.*; Almera (9) p. 686.

Middle Meiocene:—Schlier,—of Mt. Cedrone in Umbria, *Conoclypeus*, *Echinolampas*, *Echinanthus*; Ugolini (236).—of Ponte dei Canti in Marche, *Hemipneustes*; Angelis d'Ossat (14) p. 64.—Helvetian,—of Bou-Medfa and Hammam-r'Ihra in Algeria, *Ech.* (p. 24), and general list of *Ech.* (p. 72); Brives (47).—of Guverchin Kala, N. end of L. Urmi, N.W. Persia, spp. of *Clypeaster*, *C. guentheri* n. sp.; Gregory (112).—of Grand Canary, *Ech.*; Rothpletz & Simonelli (200).

Lower Meiocene. Langhian (= Burdigalian) of Bormida basin, and distribution elsewhere, *Ech.*; Airaghi (3) p. 251 and (4) p. 146.—Cartennian of Bou-Medfa and Hammam-r'Ihra in Algeria, *Ech.* (p. 22), of Ouillis-Mostaganem, *Ech.* (p. 55), and general list of *Ech.* (p. 68); Brives (47).

e. **Oligocene**:—Piedmont, *Echinolampas cassinellensis*, n. sp.; Loriol (154) p. 5.

Upper Oligocene of Göd on Danube, Hungary, *Schizaster*; Böckh (40) p. 13.

Aquitanian and Tongrian of Bormida basin, and distribution elsewhere, *Ech.*; Airaghi (3) pp. 247, 251 and (4) pp. 144, 146.

f. **Eocene**:—Spain, list of Echinoderms; Mallada (167) pp. 193–198.—Montserrat, Spain, *Ech.* with many nomina nuda of Lambert; Almera (10) p. 703.—Catalogue of *Ech.* from Egypt, with n. spp. of *Rhabdocidaris*, *Gisopygus* n. g., *Bothriolampas* n. g., *Pericosmus*, *Megapneustes* n. g., and revision of horizons and localities; Fourtau (96) pp. 633–692, also (98).

Bartonian of Poleo near Schio, n. spp. of *Spatangus*, *Hypsospatangus*, and *Eupatagus*; Mazzetti (172).—Base of Priabona beds (yellow limestone with *Leiopedina tallavignesi*) near Lonigo in Mti. Berici, Vicenza, Italy, *Lambertia gardinalei* n. g. et sp.; Oppenheim (186).

Nummulitic:—"Nummulitenschichten von Mattsee" near Salzburg, Tyrol, *Rhizocr.*, *Pentacr.* and 13 *Ech.* genera; Fugger (101) p. 393.—Glauconie grossière at base of Mokattam contains numerous marginals of *Ast.*, ? *Goniaster*, associated with *Porocidaris schmideli* and *Echinolampas africanus*; Fourtau (95).—Nummulite Limestone, between Lapsaki and Güredsche, near mouth of Kara-Dere, *Conoclypeus conoideus* and columnals of ? *Bourgueticrinus*; Toula (232) p. 67.

Jamaica, Cambridge formation, Catadupa beds, *Scutellina*, *Acrocidaris*, *Diplopodia*, *Echinolampas*, *Echinanthus*, *Pygorhynchus*, *Macropneustes*, and "*Rapinot pneustio*" [sic]; Hill (122) p. 128.

Lower Leigh Valley, Victoria, list of *Ech.*; Dennant & Mulder (68) p. 86.—Limestone at Spud Point, near R. Aire, Victoria, *Ech.* (p. 39), Calder Limestones, *Ech.* (p. 45), Aire coastal sections, *Ech.*

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(p. 47, 49), Castle Cove, *Ech.* and *Pentacr. stellatus* (p. 50); HALL & PRITCHARD (117).

(iii) MESOZOIC.

a. **General** :—Vacant.

b. **Cretaceous** :—

1. Upper:—

Spain, list of Echinoderms; MALLADA (167) pp. 161–167.—Mexico, *Ech.*; AGUILERA (1A) p. 215.

Danian :—Scandinavia, list of *Ech.* and *Crin.*; HENNIG (119) p. 149.

Danian and Senonian :—Rancocas, Monmouth, and Matanian formations, New Jersey, lists of *Ech.*, also *Pentacr.* and *Goniaster* from Rancocas; CLARK (59) pp. 179, 185, 189, and preliminary in CLARK (58).

Senonian :—Near Dorchester, *Ech.* and *Crin.* according to zones; JUKES-BROWNE in REID (195) pp. 9–16 and text-figg. 5–8.—Central Appennines 'Scaglia rosata,' *Ech.*; BONARELLI (42).—The Dahra, Algeria, *Bolbaster*; BRIVES (47) p. 19.—Egypt, *Rhabdocidaris crameri*; FOURTAU (96) p. 615.—Caucasus, *Crin.* and *Ech.*, see especially *Austinocr.*, *Ananchytes*, *Coraster*, *Inflataster*, *Stegaster*, *Prenaster*; ANTHULA (18) pp. 57–66. Upper Senonian,—Between Daridje and Eski-Hissar, Asia Minor, *Ananchytes ovatus*, *Holaster*, ?n. sp.; TOULA (232) p. 66.—Fanivelona, E. of Madagascar, *Balbaster*, *Epiaster*; BOULE (45) p. 133.—Yorkshire, *Ech.* as zonal fossils, range of *Marsupites*; LAMPLUGH (145) p. 31.—Middle Quarry at Beverley, Yorkshire, *Marsupites*; ANON (15).—From Hull's Quarry, Judge's pit, and Victoria Whiting Works, near Beverley, Yorkshire, *Marsupites*, *Ananchytes ovatus*; ANON. (16).—France, distribution of *Marsupites*; PERON (189) p. 510.—Horizon of *Actinocamax granulatus*, near Brunswick, *Cidaris* aff. *sceptrifera*, *Bourgueticr. ellipticus*, *Marsupites ornatus*; KLOOS (138).—Runge'schen Ziegelei, Brunswick, *Marsupites ornatus*; FRUCHT (99).—Algeria, *Marsupites* associated with *Hemiaster fourneli*, *H. asperatus*, *Holectypus serialis*, *Cyphosoma delamarrei*, *Goniopygus durandi*; PERON (189) p. 510.—"Hornstein des Aachener Waldes," *Hemiaster* and *Plesiaster* n. spp.; SCHLUETER (209) pp. 121, 123. Lower Senonian,—Firestone of Börssum and Königslutter in Brunswick, spines of *Cidaris clavigera*; KLOOS (139).—Börssum, spines of *Cidaris*, cf. *C. globiceps*; KNOOP (140).—"Oberen Mergel-schichten" of Ürmös in Siebenbürgen, *Stenonia*, *Cardiaster*; SIMIONESCU (215) p. 231.—Fletcher's chalk-pit, Gravesend, high-crested form of *Micraster coranguinum*, *Echinocorys vulgaris*, *Echinoconus conicus* and small rounded var., *Cyphosoma kœnigi*, *Cidaris perornata*, *C. sceptrifera*, *Goniaster*, *Ophiura* ?, *Bourgueticr. ellipticus*; DIBLEY (75).—Zones of *Micraster coranguinum*, *M. intermedius*, and partly *M. cortestudinarium*, near Louviers (Eure), list of *Ech.* incl. *M. cormarimum*; FORTIN (89).—Cliff between Tréport and Ault, *Micraster cortestudinarium* found by Geng; CAPON (51) p. 392.—Préaux, near Rouen, *Cardiaster cotteauanus*; CAPON (51) p. 391.—Alpes-maritimes, distribution of *Ech.*, occurrence of *Micraster leskei*, *M. heberti*, and *M. arenatus*; RIAZ (198).—Extreme N. of Madagascar, *Lampadaster gauthieri*; BOULE (45) p. 130.

Blue Mountain Series, lower division, Jamaica, *Salenia*; HILL (122) p. 118.

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Senonian to Cenomanian, S. of England, analysis of *Micraster* zone by zone; ROWE (202).

Turonian:—Borders of the Wash, *Ech.*; WHITAKER & JUKES-BROWNE (251) p. 69.—Zone of *Holaster planus*, Cuxton, Kent, *Pentacrinus* and *Micraster* intermediate in form between *M. corbovis* and *M. coranguinum*; DIBLEY (76).—Gour Ouargla, Algeria, *Cyphosoma* and *Hemiaster*; ROLLAND (199) p. 46.—Zone of *Hemiaster fourneli* in Algeria, criticism of Welsch; PERON (189) pp. 506–509.—*Holaster planus*, *H. placenta*?, *H.* sp., *Micraster* cf. *de lorioli*, *M.* sp., *Hemiaster* sp. from Mokošín, Valy, Lahn ob. Gruben, and Krchleb, in E. Bohemia; ŽELÍZKO (260).—Zone of *Inoceramus labiatus* at Glodu in Carpathians, *Cardiaster*, *Micraster*; ATHANASIU (20) p. 452.

Cenomanian:—Borders of the Wash, *Ech.*; WHITAKER & JUKES-BROWNE (251) p. 57.—Near Laghet, Alpes-maritimes, *Holaster subglobosus*, *Epiaster crassissimus*?; RIAZ (198) p. 413.—Roumania, *Ech.* spines and *Antedon* [!, q.v.]; POPOVICI-HATZEG (193) p. 4.—Lebanon, *Pygurus noetlingi*, n. sp.; LORIOL (154) p. 4.—Sinai, Wady Mokatteb, quoted by Duncan 1867, is not a locality for fossil *Ech.*; FOURTAU (96) p. 630. Upper Cenomanian,—Egypt, *Cidaris glandaria*, *Pseudocidaris pasqualii* n. sp., *Pseudodiadema meunieri* n. sp., *Orthopsis rupellii*, *Echinoconus aegyptiacus*, and many common spp.; FOURTAU (96), also (98).—El-Goléa, Algeria, *Rhabdocidaris pouyannei*, *Holectypus excisus*? (p. 55): Mechgarden, S.E. of El-Goléa, Algeria, *Hemiaster pseudo-fourneli*, *H. zitteli*, *H. africanus*?, *Pseudodiadema*? (p. 49): *Heterodiadema libycum*, a Carentonian species, from S. of Tripoli (p. 70); ROLLAND (199).

Albian, Red Chalk of Hunstanton, *Ech.*, *Crin.*; WHITAKER & JUKES-BROWNE (251) p. 42.—Gault at Miliana in Algeria, *Ech.*; BRIVES (47) p. 17.

2. Lower:—

Spain, list of Echinoderms; MALLADA (167) pp. 117–119.

Aptian, Upper Aptian, "marnes à *A. Nisus* et *A. furcatus*," "dans l'île Maïre aux environs de Marseille," *Toxaster*, *Echinospatagus*, and *Pentacr.* [i.e. *Isocr.*] n. sp.; REPELIN (197).—Aptian of Costas de Garraf, Spain, *Ech.* with nomina nuda of LAMBERT; ALMERA (11) p. 810.

Neocomian, Speeton Clay, Yorkshire coast, *Echinospatangus cordiformis*, *Cidaris*, and *Pentacr. annulatus*; LAMPLUGH (144) pp. 592, 596, 599, 602, 616.—Quadersandstein of Schusterberg and Gersdorfer Burg, *Toxaster complanatus*; MAAS (163) p. 249.

c. **Jurassic**:—Spain, list of Echinoderms; MALLADA (167) pp. 94, 95.—Yellowstone Park, Black Hills, and Utah, *Pentacr. asteriscus*, also fragmentary *Ech.* from Yellowstone; STANTON (221) pp. 603, 608, 609.—Mexico, *Crin.*, *Ech.*; AGUILERA (1A) p. 207.

1. Upper:—

Portlandian (=Tithonian); Red Limestone of Nesselsdorf in Bohemia is an Echinoderm facies of the Stramberg beds, list of *Echinoderma* incl. inter alia *Antedon* n. sp., *Cyathidium*, *Sclerocr. compressus*, *Tetracr.*, *Pentacr.*; REMEŠ (196).—Mte Judica in Catania, *Diadema*; NELLI (179) p. 54.—Mangychlak, Transcaspian, *Cidaris* and *Metaporhinus*; SEMENOV (212) p. 38.

2. Middle:—

Argovian,—"Corallien inférieur," Rauracian, "calcaire à polypiers, de sous-étage dicératien," partly as limestone, partly as argillaceous residue, at Mailly-le-Chateau and neighbouring localities in Dept.

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l'Yonne, France, spines of *Cidaris*, *Rhabdocidaris*, *Diplocidaris*, *Hemicidaris*, *Acrocidaris*, descr. and figd. by VALETTE, account of deposit, and list of *Crin.* by PERON (237).

Oxfordian,—Of Tuar Kyr, Transcaspian, *Metaporhinus* and *Millericr.*; SEMENOV (212) p. 80.

Callovian,—Oberer Braune Jura, ε and ζ, of Baden, "Knorrithone" [! zone of *Ostrea knorri*], *Pentacr.*, *Asterias* (p. 728), "Variansschicht" [zone of *Rhynchonella varians*] *Pentacr.*, *Acrosalenia*, *Holectypus*, *Galeropygus*, *Collyrites* (p. 733), zone of *Amm. macrocephalus*, *Mespilocr.*, *Pentacr.*, *Asterias*, *Cidaris*, *Pseudodiadema*, *Holectypus*, *Galerites*, *Collyrites* (p. 751), "Ornatenthone" [zone of *Amm. ornatus*], *Holectypus* (p. 768); SCHALCH (208).

3. Lower:—

Bathonian,—"Ferrugineus-Schichten" of Vögisheim near Mullheim in Baden, *Dermaster boehmi* n. g. et sp.; LORIOL (155).—Bradfordian of Calvados, list of spp. of *Crin.*, and special account of horizon of *Isocr. nicoleti* and *Antedon schlumbergeri* near Lion-sur-mer, associated with *Goniaster* sp. and *Hemicidaris langrunensis*; BIGOT (39).

d. **Lias**:—Red limestone with *Pentacr.* near St Moritz; MOESCH (176A).—Spain, list of Echinoderms; MALLADA (167) p. 73.

Middle and Lower,—*Am. capricornus* zone, *Pentacr. scalaris*, *Extracr. subangularis*, *Ophioderma*?, *Cidaris* sp.; *Am. henleyi* zone, *Pentacr. scalaris*; *Am. jamesoni* zone, *Pentacr. scalaris*; *Am. armatus* zone, *Pentacr. tuberculatus*, *Acrosalenia*?; *Am. oxynotus* and *raricostatus* zones, *Pentacr. tuberculatus*; *Am. turneri* zone, *Cidaris edwardsi*?: all between Rugby and Catesby, England; THOMPSON (229) p. 87.

e. **Trias**:—Spain, list of Echinoderms; MALLADA (167) p. 70.

Upper,—calcari rossi e grigi del Monte Clapsavon nella Carnia occidentale, *Encrinus*; TOMMASI (231) p. 9.

Middle,—Semmeringkalke, N.E. Alps, columnals of *Encrinus liliiformis* and *Pentacrinus*; TOULA (233).—Tschung-tjen, China, *Cidaris*, *Encrinus*; LÓCZY (149) pp. 159, 160.

(iv) PALÆOZOIC.

a. **General**:—Geological and geographical distribution of genera and spp. of *Cystidea*; JAEKEL (130) passim, esp. p. 144, of *Caryocrinidæ*, p. 304, of *Diploporita*, p. 366, of *Thecoidea* (=*Edrioasteroidea*), p. 26.

b. **Permian**:—Vacant.

c. **Permo-Carboniferous**:—Young-tschang-fu, Pu-pjao, and Talischau, in Yunnan, China, columnals referred [with too little hesitation] to *Poteriocr.* and *Cyathocr.*; Yarkalo in Laut-san-kiang valley, China, columnals of *Cyathocr.* [?], brachials of *Symbathocr*?; LÓCZY (149) pp. 116, 117, 123, 129, 132.

d. **Coal Measures**:—Upper Carboniferous of Teng-tjan-tsching near Kan-tschou-fu, China, columnals of *Cyathocr.* [?]; LÓCZY (149).

Topeka, Kansas, n. spp. *Oligoporus*? from Deer Creek limestone, *Erisocr.* from Osage coal, *Ceriocr.* from shales above Osage coal; BEEDE (30). Upper Coal Meas.,—stratum 97 of Pumpelly, Kansas City, Mo., *Ceriocr. nodulifera* [sic] and *Erisocr. toddanus*, n. spp.; BUTTS (50).

e. **Lower Carboniferous**:—Spain, list of Echinoderms; MALLADA (167) p. 60.—Carboniferous Limestone, Cape Cherni, Novaya Zemlya,

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columnals which "may represent two such forms as *Poteriocrinus* and *Actinocrinus*"; NEWTON (180) p. 296.—Sa-men-qua Pass in Ta-tya-shan Mts., Kan-su, China, *Crin.* limestone; LÓCZY (149) p. 183, and LORENTHEY, p. 246.

Dimetian,—Zone of *Orthis resupinata*, Egypt, *Archaeocidaris* or *Eocidaris*; FOURTAU (96) p. 612.—Horizon *V 1a* of Pair, in Clavier, Belgium, *Palechinus sphericus*; DESTINEZ (72).

Tournaisian,—Pair in Clavier, Belgium, *Platycr.* cf. *mullerianus* (p. 289), *Palaechinus koenigi* (p. 290), with complete list of *Ech.* and *Crin.* (p. 295); DESTINEZ (69): *Poteriocr.*; DESTINEZ (70).

Madison Limestone (about contemporary with Kinderhook), Yellowstone Park, U.S.A., *Platycr.*, *Scaphiocr.*; GIRTY (105) p. 515.

Lower Carboniferous (or ?Devonian) near La Ligua in Chile, *Poteriocr.*?; PHILIPPI (192).

f. **Devonian**:—Spain, list of Echinoderms; MALLADA (167) pp. 38, 39.

Milwaukee, Wis., list of *Crin.* and *Blast.*; MONROE & TELLER (177) p. 282.—Jeffersonville Limestone and Sellersburg beds of S. Indiana and central Kentucky, list of *Crin.* and *Blast.*, also Riverside Sandstone, *Catillocr.*, and Rockford Limestone, *Symbathocr.*; KINDLE (137) p. 49.

Upper,—*Dinocystis barroisi* comes from Assises d'Evieux et Monfort of Famennien supérieur, and not from Assise d'Esneux of Fam. infr.; BATHER (23).—Assise d'Esneux, at Tohogne, Belgium, *Protaster*; DESTINEZ (71).—Nehdener Schiefer at Nehden, and Saalfeld in Thuringia, *Cosmocrinus holzapfeli* n. sp.; JAEKEL (128) p. 32.

Middle,—Pilton beds of N. Devon and Somerset, spp. of *Lepidesthes*?, *Protocidaris* n. g., *Palaeaster*, *Drepanaster*? n. g., *Protaster*?, *Eugaster*?, *Ophiurella*?, *Pentremitidea*, *Codaster*, *Taxocr.*, *Rhodocr.*?, *Megistocr.*?, *Mariacr.*?, *Actinocr.*?, *Platycr.*?, *Adelocr.*, *Poteriocr.*?, *Scaphiocr.*?, *Scytalecr.*?, *Coeliocr.*?, many n. spp.; WHIDBORNE (250).—Zone of *Phacops potieri*, Ille-et-Vilaine, *Haplocr. boitardi*, *Hexacr.* sp.; KERFORNE (135) p. 344.

Hamilton Group, Western New York, lower Moscow shale, *Ancyrocr.*, *Habrocr.*, Hamilton shale, *Gennaeocr.*, *Dorycr.*?, *Platycr.*, *Taxocr.*, *Ancyrocr.*, et columnæ radicesque; GRABAU (107) p. 141–148.—Lower Moscow shale, *Taxocr.*, *Ancyrocr.*, *Hadrocr.*, Upper Hamilton shale, *Gennaeocr.*; GRABAU (108) p. 285, table iii.

Lower,—various locc. and horizons near the Lorelei, Rhineland, *Diamenocr.* (pp. 6, 13, 22, 48, 91), *Acanthocr.* (pp. 10, 57), *Cyathocr.* cf. *grebei* (p. 32), *Gastrocr.*? (p. 52), *Ctenocr.* (p. 57), *Crulicocr.* (p. 57) and *Ech.*? (p. 57); FUCHS (100).—Bohemia, *Crin.* indet. vide sub *Encrinites* et *Entrochus*; WAAGEN & JAHN (246).—Corniferous of Ohio, *Nucleocr. verneuili*, *Codaster pyramidatus* at Marble Cliff (p. 16) and Columbus (p. 20), *C. pyramidatus* at Dublin (p. 21), *N. verneuili* at Marion (p. 27) and White House (p. 33), *Dolatocr. liratus* and *Megistocr. spinulosus* at Columbus (p. 20); BOWNOCKER (46).

g. **Silurian**:—S. Scotland, *Oph.*, *Crin.*, *Ech.*; PEACH (188) pp. 670, 687, 709.—Ludlow shales, Leintwardine, Shropshire, *Palaeasterina bonneyi*; GREGORY (111) p. 349.—Bohemia, *Beyrichocr.*, *Bohemicocr.*, *Calpiocr.*?, *Carolicr.*, *Ichthyocr.*, *Scyphocr.*, *Vletavicr.*, *Zenkericr.*, cum fragmentt. indett. sub *Encrinites* et *Entrochus*, with general tables, pp. 196 et sq.; WAAGEN & JAHN (246).—Silurian *f*2 at Pleschiwetz, Bohemia, *Proteocystis flavus*; KAYSER & HOLZAPFEL (132) p. 505; K. & H. consider *f*2 as Lower Devonian.—Base of *f*2 Slatý Kun, Bohemia, columnals of *Crotalocrinus*; KAYSER & HOLZAPFEL (132) p. 507: this identification doubted by WAAGEN & JAHN (246) p. 140.

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—Middle and Upper Silurian of Mukscha, Dumanov, and Kamenez-Podolsk in Podolia, *Crotalocr.* and *Crin.* indett.; VENYUKOV (239) p. 94.

Dolomite of Burnt or Mann Id. in L. Temiscaming, Canada, slabs of crinoidal limestone with crowns, referred to *Taxocr.*, *Dendrocr.*, *Thysanocr.*; AMI (12) pp. 292 i, 294 i.

Upper Trilobite bed of Wenlock Series at Bowning, N.S.W., *Sturtzaster mitchelli* n. sp.; ETHERIDGE (83).

h. **Ordovician**:—Spain, list of Echinoderms; MALLADA (167) p. 26.—Bohemia, *Caleidocr.* in *d* 4, cum fragmentt. indett. sub *Encrinites* et *Entrochus* in *d*, 1, 2, 4, 5; WAAGEN & JAHN (246).—China, Yunnan, *Hemicosmites*?; LÓCZY (149) p. 22.—S. Scotland, *Cyst.*, *Crin.*, *Ast.*; PEACH (188) pp. 670, 687, 698, 701.

Caradoc of Shropshire, *Palaeaster caractaci* n. sp.; GREGORY (111) p. 344.—Raheen Shales, = Llandeilo, of Newtown Head, co. Waterford, Ireland, *Cheirocrinus* cf. *penniger*, *Echinosphaera granulata*? (p. 723): Tramore Limestone, Stages 3 and 2, = Cystidean Limest. of Scandinavia, Tramore Bay, co. Waterford, *Echinosphaera*, *Bolboporites*, *Glyptocystis* (p. 732); REED (194).

Trenton, Galena series, St. Paul, Minn., *Strophocr. dicyclicus* n. g. et sp., *Lichenocr.*; SARDESON (207).—Trenton limestone, Mattawa, near Ottawa, *Crin.* columnals (p. 298 i): Trenton?, L. Nipissing, *Crin.* and *Cyst.* fragments (? *Palaeocystis*) (p. 300 i); AMI (12).

k. **Cambrian**:—Spain, list of Echinoderms; MALLADA (167) p. 23.—Fucoid shales, a band or ironstone in Allt nan Dearcaig near Achnashellach, Ross-shire, Scotland, "organic remains show structures resembling those of echinoderms," "not improbable that some...may be Cystideans"; HORNE (123).

Division *1* b, Long Id., Nova Scotia, *Trochocystis*; MATTHEW (171) p. 128.

l. **Pre-Cambrian**:—Etcheminian in Newfoundland and New Brunswick, fragments of *Cystidea*, also *Platysolenites*, which the author refers to *Crin.*; MATTHEW (170) p. 53.

IV. SYSTEMATIC†.

(A.)—ECHINODERMA IN GENERAL.

Echinoderma divided according to mode of feeding, into *Microphagi* and *Megophagi*; the latter into *Monorchida*, without buccal armature, and *Pentorchida* with buccal armature; *Pentorchida* again into *Helkopoda*, with tube-feet (*Ast.* and *Ech.*), and *Ophiuroidea*, with muscular arms; SOLLAS (216) p. 715: LAMBERT in Review points out that many *Ech.* have no more buccal armature than has a Holothurian.

According to origin of genital rachis, *Crin.* and *Hol.* are *Monorchonia*, while *Ech. Ast. Oph.* are *Pentorchonia*, thus differing from Haeckel's conception; RUSSO (204) p. 292.

† A dagger prefixed to the trivial name of a species indicates that it is fossil; prefixed to the name of the author, it denotes that the reference is to the species in a fossil state; prefixed to the name of a genus, it indicates that all species of the genus here recorded are fossil, and the † is therefore not repeated before each name. The abbreviations *l. c.* and *op. cit.* refer only to the place or work quoted *immediately before*.

A name and reference quoted without further statement [*e.g. Actinopyga mauritiana*; BEDFORD (29)] indicate that the quoted author's statement refers merely to locality or some question of slight importance. Further information can usually be gleaned from the cross-references under TITLES.

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Edrioasteroidea reinstated as a distinct Class of *Echinoderma*; BATHER (22) p. 917: called *Thecoidea*; JAEKEL (130).
Eleutherozoa, name extended and defined to incl. *Hol. Ech. Ast. Oph.*; BATHER (22) p. 917.
Helkopoda, **div. nov.** incl. *Asteroidea* and *Echinoidea*; SOLLAS (216) p. 714.
Megophagi, nom. nov. pro *Eleutherozoa*; SOLLAS (216) p. 715.
Microphagi, nom. nov. pro *Pelmatozoa*; SOLLAS (216) p. 715.
Pelmatozoa defined; BATHER (22) p. 919.

(B.)—HOLOTHURIOIDEA.

Achlyonice, redefined; HÉROUARD (121) p. 175.
Actinopyga echinites, colour in spirit (?); BEDFORD (29) p. 836. *A. lecanora*, podia (p. 149); *A. maculata* or ?*A. hadra* (p. 150): BEDFORD (28). *A. mauritiana*; BEDFORD (29) p. 835: podia, colour; BEDFORD (28) p. 149. *A. parvula*, incl. *Mulleria flavocastanea* Theel, specimens fr. Funafuti descr., spicules figd.; BEDFORD (29) p. 836, pl. lii.
Benthothuria funebris, diagnosed; R. PERRIER (191) p. 248.
Chiridota seu *Chirodota*:—*C. intermedia*, **n. sp.**, mangrove swamp, Funafuti; BEDFORD (29) P. Zool. Soc. London, 1898, p. 846, pl. liii. *C. lævis*; BIDENKAP (38) p. 106. *C. liberata*; BEDFORD (29) p. 845. *C. rigida*; BEDFORD (28) p. 143. *C. rotifera*, Bermuda; CLARK (56) p. 134. *C. rufescens*; LUDWIG (158); BEDFORD (28) p. 143.
Cucumaria assimilis, vide *Pseudocucumis africana*. *C. frondosa*; BIDENKAP (38) p. 106. *C. grubii*, breeding period, habitat; *C. planci*, breeding period, fissiparity, habitat: LO BIANCO (147) p. 475. *C. punctata*, colour and variations; CLARK (56) pp. 123, 124, 133. *C. syracusana*, breeding period, habitat; LO BIANCO (147) p. 475.
Elpidia, redefined, incl. *E. glacialis*, *E. abyssicola*, *E. echinata*; HÉROUARD (121) p. 174. *E. glacialis*, evidence for bipolarity; THOMPSON (230) p. 317. *E. incerta* and *E. purpurea*, v. sub *Peniagone*. *E. verrucosa*, v. sub *Scotoplanes*. *E. willemoesi*, v. sub *Peniagone*.
Elpidiinæ, revision of genera; HÉROUARD (121) p. 174, text fig. 4.
Euapta, vide sub *Synapta*.
Eunypniastes, redefined; HÉROUARD (121) p. 175.
Euphronides depressa, evidence for bipolarity; THOMPSON (230) p. 317.
Herpysidia, diagnosed, *H. reptans* [introduced as n. sp., but see Zool. Rec. 1898], diagnosed; R. PERRIER (191) p. 247.
Holothuria abbreviata, Heilprin from Bermuda, is *H. captiva*; CLARK (56) p. 125. *H. albiventer*, does not incl. *H. aculeata*, *H. bowensis*, or *H. modesta*; LUDWIG (158) p. 558. *H. atra*; LUDWIG (158) p. 559: var. *amboinensis*, variation in number of stone-canals and Polian vesicles; BEDFORD (28) p. 147: internal anatomy of 4 specimens compared; BEDFORD (29) p. 839. *H. captiva*, Bermuda; CLARK (56) pp. 125, 133. *H. cinerascens*, colour, variations in Polian vesicles, stone-canals, and Cuvierian organs; BEDFORD (28) p. 148. *H. decorata*, colour like *H. monacaria*, spicules; BEDFORD (28) p. 146. *H. difficilis*, measurements, colour in spirit (?); BEDFORD (29) p. 838, pl. lii. *H. difficilis* ?, perhaps allied to *Actinopyga parvula*; BEDFORD (28) p. 149. *H. edulis*; BEDFORD (28) p. 147: incl. *H. signata* Lampert and of Ludwig who described spicules upside-down; LUDWIG (158) p. 559. *H. floridana*, Heilprin from Bermuda non Pourtales, is *H. surinamensis*; CLARK (56) p. 122. *H. forskali*, breeding period, habitat; LO BIANCO (147) p. 475: Cuvierian organs; RUSSO (203). *H. fuscocinerea*, var. *pervicax*, measurements, variation of spicules; BEDFORD (29) p. 837, pl. lii. *H. huberti*, **n. sp.**, 1 metre, at C. St Elia,

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G. of Cagliari, Sardinia, spicules and the numerous Polian vesicles figd., madreporites, lacunæ, colour, is associated with *H. tubulosa* and passage-forms between the two are found; Russo (205) Monit. Zool. Ital. x, p. 225. *H. helleri*, Cuvierian organs; Russo (203). *H. impatiens*; Ludwig (158) p. 558: incl. *H. botellus* Sel.; Bedford (28) p. 145: measurements, colour in spirit (?), internal anatomy of 4 specimens compared; Bedford (29) p. 840: respiratory trees, anatomy and physiology; Bordas (43): generative organs; Bordas (44): Cuvierian organs; Russo (203). *H. intestinalis*, breeding period; Aurivillius (21) p. 16. *H. lentiginosa* Marenz. perhaps a var. of *H. pardalis*; Bedford (28) p. 145. *H. lubrica*, Zanzibar; Ludwig (158) p. 560. *H. maculata*; Bedford (28) p. 146, & (29) p. 842. *H. monacaria*; Ludwig (158) p. 557; Bedford (28) p. 146: internal anatomy of 3 specimens compared; Bedford (29) p. 841. *H. nigra*, distribution, habitat, habits; Allen (8) p. 461. *H. pardalis*; Ludwig (158) p. 559: probably incl. *H. subditiva*, measurements, colour, spicules; Bedford (29) p. 839: var. *insignis*, spicules; Bedford (28) p. 145. *H. rugosa*; Bedford (29) p. 839, pl. liii. *H. santori*, Cuvierian organs; Russo (203). *H. surinamensis* from Bermuda, compared with type, variations in number of tentacles and Polian vesicles; Clark (56) pp. 121, 133. *H. thomsoni*, evidence for bipolarity; Thompson (230) p. 317. *H. tubulosa*, breeding period, habitat, commensal; Lo Bianco (147) p. 475: generative organs; Bordas (44): respiratory trees, anatomy and physiology; Bordas (43): vide etiam sub *H. huberti*. *H. vagabunda*; Ludwig (158) p. 558; Bedford (29) p. 842: spicules; Bedford (28) p. 145, pl. xvii. *H. willeyi*, **n. sp.**, Blanche B., New Guinea; Bedford (28) p. 148, pl. xvii.

Irpa abyssicola, v. sub *Elpidia*.

Kolga seu *Kolge*:—redefined, incl. *K. hyalina*, *K. affinis*, *K. challengeri*, *K. furcata*, *K. insignis*, *K. naresi*, *K. obsoleta*, *K. porcellus*, *K. robusta*, *K. rosea*; Hérouard (121) p. 175. *K. furcata*, **n. sp.**, dredged by 'Princesse Alice,' Station 698; Hérouard (121) p. 171, text-fig. 2. *K. nana*, evidence for bipolarity; Thompson (230) p. 318: vide etiam sub *Scotoplanes*. *K. obsoleta*, **n. sp.**, dredged by 'Princesse Alice,' Station 753; Hérouard (121) p. 170, text-fig. 1.

Laetmogone wyville-thomsoni, evidence for bipolarity; Thompson (230) p. 318.

Leptosynapta Verrill, syn. of *Synapta*; Clark (57) p. 22.

Mesothuria, modification of Ludwig's diagnosis (p. 244); *M. expectans* [sic], **n. sp.**, depth and locality not stated, no figure (Bull. Mus. Paris, 1899, p. 245); *M. intestinalis*, diagnosed (p. 244); *M. maroccana*, diagnosed (p. 245); *M. verrilli*, diagnosed (p. 245): R. Perrier (191).

Orcula (*? Phyllophorus*) *dubia*, **n. sp.**, Lifu, Loyalty Is., no diagnosis, but spicules figd.; Bedford (28) p. 144, pl. xvii.

Paelopatides grisea, perhaps a var. of *P. confundens*; R. Perrier (191) p. 248.

Parelpidia, redefined, incl. *P. elongata*, *P. cylindrica*; Hérouard (121).

Peniagone, redefined, incl. *P. wyvillei*, *P. atrox*, *P. azorica*, *P. horrifer*, *P. incerta*, *P. lugubris*, *P. purpurea*, *P. vitrea*, *P. willemoesi*; Hérouard (121) p. 175. *P. affinis*, *P. challengeri*, *P. naresi*, *P. porcellus*: v. sub *Kolga*.

Periamna roseum, v. sub *Kolga*.

Phyllophorus, v. sub *Orcula*. *P. urna*, breeding period, habitat; Lo Bianco (147) p. 476.

Pseudocucumis africana; Ludwig (158) p. 561: incl. *Cucumaria assimilis* Bell and *P. theeli* Ludw.; Bedford (28) p. 144: variations in tentacular symmetry, compared with *P. mixta*, *P. acicula*, *P. inter-*

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cedens, *P. japonica*, gastropod ova in the mucoid capsules; BEDFORD (29) p. 843, pl. liii.

Pseudostichopus atlanticus, diagnosed; R. PERRIER (191) p. 246.

Psolus phantapus, *P. squamatus*; BIDENKAP (38) p. 106.

Psychropotes grimaldii, **n. sp.**, 4020 metres, Azores, spicules figd.; HÉROUARD (120) p. 167, text-fig. 2.

Scotoanassa, redefined (p. 175), incl. *S. diaphana*, and *S. translucida* **n. sp.**, dredged by 'Princesse Alice,' Stations 749, 753 (p. 171, text-fig. 3); HÉROUARD (121).

Scotoplanes, redefined, incl. *S. globosa*, *S. delagei*, *S. mollis*, *S. murrayi*, *S. nana*, *S. papillosa*, *S. verrucosa*; HÉROUARD (121) p. 174. *S. delagei*, **n. sp.**, 1165–1385 metres, Azores, spicules figd.; HÉROUARD (120) p. 167, text-fig. 3. *S. insignis*, and *S. robusta*, v. sub *Kolga*.

Semperia bermudensis Heilpr. is syn. of *Cucumaria punctata*; CLARK (56) p. 123.

Stichopus chloronotus, containing *Fierasfer homei*; BEDFORD (28) p. 150. *S. diaboli*, probably syn. of *S. moebii*, and incl. *S. haytiensis*, Theel from Bermuda non Semp.; *S. moebii*, probably immature *S. diaboli*; CLARK (56) pp. 119, 133. *S. regalis*, breeding period, habitat, commensal; LO BIANCO (147) p. 476: respiratory trees, anatomy and physiology; BORDAS (43). *S. richardi*, **n. sp.**, 351 metres, B. of Biscay, spicules figd.; HÉROUARD (120) p. 165, text-fig. 1.

Synallactes crucifera, diagnosed; R. PERRIER (191) p. 247.

Synapta acanthia, **n. sp.**, sand, Bermuda; CLARK (56) pp. 126, 134, pl. iv. *S. ayresi* Sel., see *S. inhaerens*. *S. beselii* et var. *agassizi*, colour; BEDFORD (28) p. 142. *S. digitata*; CONDORELLI (61) p. 36. *S. girardi* Pourt., see *S. inhaerens*. *S. godeffroyi*, adult and young, colour differences; BEDFORD (29) p. 847. *S. gracilis* Sel., see *S. inhaerens*. *S. inhaerens*, Bermuda; CLARK (56) p. 134: incl. *S. tenuis*, *S. girardi*, *S. ayresi*, *S. gracilis*, bionomics, sizes of spicules, senses and sense-organs, ciliated funnels; CLARK (57) pp. 23, 25, pls. x, xi: breeding period, habitat; LO BIANCO (147) p. 476. *S. johnstonii*, breeding period, habitat; LO BIANCO (147) p. 476. *S. kefersteini*, number of tentacles, spicules; BEDFORD (29) p. 847. *S. ooplax*, tentacles; LUDWIG (158) p. 562: spicules partially decalcified, ?artificially; BEDFORD (29) p. 848: var. *laevis*, **n. var.**, Sandal Bay, Lifu, Loyalty Is.; BEDFORD (28) p. 141, pl. xvii. *S. recta*, colour; BEDFORD (28) p. 142. *S. reticulata* var. *nigro-purpurea*, **n. var.**, colour perhaps correlated with habitat, between tide-marks, I. of Pines, New Caledonia; BEDFORD (28) p. 142. *S. roseola*, Bermuda; CLARK (56) p. 134: maintained, compared with *S. inhaerens*, bionomics &c. as under *S. inhaerens*; CLARK (57) pp. 23 et sqq., pls. x, xi. *S.* (*Euapta*) *serpentina*; LUDWIG (158) p. 562. *S. tenuis* Ayres, see *S. inhaerens*. *S. vittata*, perhaps incl. *S. serpentina*; BEDFORD (28) p. 142. *S. vivipara*, habitat, Bermuda; CLARK (56) p. 134.

Thyone aurantiaca and *T. fusus*, breeding period, habitat; LO BIANCO (147) p. 476.

Thyonidium drummondi; BIDENKAP (38) p. 105.

Tutela echinata, v. sub *Elpidia*.

Zygothuria, diagnosed (p. 245); *Z. connectens*, diagnosed (p. 246); *Z. lactea*, varr. *typica* et *oxysclera*, **n. var.**, diagnosed (p. 246): R. PERRIER (191).

(C).—ECHINOIDEA.

†*Acrocidaris* sp. ? *nobilis* vel *formosa*, Rauracian of l'Yonne; VALETTE (237) p. 146.

†*Agassizia zitteli*; FOURTAU (96) p. 715.

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†*Amblypygus dilatatus*, a large specimen, the *Clypeus* (*Semi-clypeus*) *pretiosus* Mayer-Eymar, descr. and figd.; FOURTAU (96) p. 646, pl. i.

Amphidetus:—vide etiam *Echinocardium*. History of the genus, the name preferred to *Echinocardium*, its geol. distrib. with list of fossil spp. (pp. 111–114); *A. cordatus*, variation in measurements, diagnostic characters, incl. *Spatangus arcuarius* Lam. and *A. goldfussi* L. Ag. (p. 109): SCHLUETER (209). *A. gibbosus* cited by Fischer, 1869, from S.W. coast of France is perhaps *Echinocardium pennatifidum* and not *E. mediterraneum* as supposed by Ludwig, 1879; KOEHLER (141) p. 179. *A. mediterraneus*, diagnostic characters; SCHLUETER (209) p. 108. *A. ovatus*, breeding period; AURIVILLIUS (21) p. 14.

†*Amphiope*, discussed; AIRAGHI (4) p. 155. *A. arcuata*; FOURTAU (96) p. 698. *A. pedemontana*, n. n.; AIRAGHI (3) p. 248: **n. sp.**, Tongrian of Dego in Bormida basin; AIRAGHI (4) Boll. Soc. geol. Ital. xviii, p. 155, pl. vi. *A. truncata*, Walther's citation from Tor, Sinai, probably incorrect; FOURTAU (96) p. 697.

†*Ananchytes* seu *Ananchytis*:—vide etiam *Echinocorys*. *A. depressa*, specimen from Daghestan descr. and measured; ANTHULA (18) p. 59, pl. ii. *A. ovata*; ANTHULA (18) p. 60; TOULA (232) p. 66.

†*Anisaster gibberulus*; FOURTAU (96) p. 668 & (98) p. 197.

Arachnoides placenta; BELL (32) p. 136.

Arbacia; UEXKÜLL (235). *A. punctulata*, development of interambulacrals, variation in genital pores; JACKSON (127) p. 130, figs. 110, 111: effect of salt-solutions on ova; MORGAN (178) p. 449. *A. pustulosa*, breeding period, habitat; LO BIANCO (147) p. 473.

Arbacina, vide *Psammechinus monilis*.

Archaeocidaris vel *Eocidaris* sp.; FOURTAU (96) p. 612.

Asthenosoma urens migrates from deep to shallow water at breeding period; SEMON (213) p. 508.

†*Astriclypeus integris* [*integer*] **n. sp.**, Tertiary sandstone of Midzuhomura, Kai province, Japan; YOSHIWARA (259) J. Geol. Soc. Tokyo, vi, p. 1, pl. ii.

†*Astrodapsis tumidus* (p. 166), *A. whitneyi* (p. 167) redescr.; MERRIAM (175) pl. xxi.

Astropyga elastica; *A. radiata*, including a "quite young specimen": BELL (32) p. 135.

†*Balbaster* [? err. pro *Bolbaster*] sp. nondescr.; BOULE (45) p. 133.

†*Bothriolampas*, **n. g.** an Eocene genus descended from the Cretaceous *Bothriopygus*, parallel to *Pliolampas*, and comparable to *Pygurostoma*, incl. 2 spp. *Pygorhynchus abundans* and *Pliolampas tunetana*; GAUTHIER in FOURTAU (96) p. 652: LAMBERT in Review doubts validity of genus, and states that in any case it is syn. of *Gitolampas* Gauth. *B. abundans* Mayer-Eymar (sub *Pygorhynchus* [1897, as *nom. nud.*, no other reference given, therefore this must be **n. sp.**]), Lower Suessonian of Gebel Garah near Assouan; GAUTHIER in FOURTAU (96) p. 655, pl. i.

Brissoma Pomel, vide sub *Brissopsis*.

Brissopsis includes *Toxobrissus* and *Brissoma*; FOURTAU (96) p. 668. †*B.* sp. ind.; AIRAGHI (4) p. 165. †*B. angusta*; FOURTAU (96) p. 666. †*B.* cf. *borsonii*; AIRAGHI (2) p. 371. †*B. fraasi*, a small specimen descr.; FOURTAU (96) p. 714. †*B. genei* var. *pliocenica* (p. 366); †*B.* cf. *intermedius* (pp. 369, 370); †*B. latissimus* (p. 366): AIRAGHI (2). †*B. lorioli* Bittner (sub *Toxobrissus*) redescr.; FOURTAU (96) p. 666, pl. i. *B. lyrifer*, breeding period; AURIVILLIUS (21) p. 15. †*B.* cf. *lyrifera* (p. 369); †*B.* cf. *lysetera* [sic] (p. 368); †*B. nicoleti* (p. 371); †*B.* aff. *ovatus* (pp. 370, 371): AIRAGHI (2). †*B. pasqualii* Mayer-Eymar, probably not *Brissopsis*; FOURTAU (96) p. 690. †*B. pecchiolii* (p. 367); †*B.* cf. *pecchiolii* (p. 368); †*B. ponteganensis*, **n. s.**, Pliocene

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of Pontegana in Lombardy (p. 367, pl.-f. 7): AIRAGHI (2): is not *Brissopsis*, but ? *Brissus*; LAMBERT in Review.

†*Brissospatangus palejensis*, **n. sp.**, Paleo in Vicentin; MAZZETTI (173) Mem. Pont. Acc. Lincei, v, p. 15, pl. i.

Brissus:—†*B. aegyptiacus*, **n. sp.**, "Helvétien II, grès inférieurs avec *Echinoneus Artini* et les *Schizaster*" Gebel Geneffé, Egypt; GAUTHIER in FOURTAU (96) p. 718, pl. iii. †*B. corsicus*; AIRAGHI (4) p. 164. *B. unicolor*; CLARK (56) p. 132: breeding period, habitat; LO BIANCO (147) p. 47[illegible].

†*Caratomus londinensis*, redescr. and discussed; FOURTAU (96) p. 663.

†*Cardiaster*:—vide etiam sub *Scagliaster* et *Stegaster*. *C. cotteauanus*, found by R. Fortin at Préaux near Rouen, associated with *Echinocorys vulgaris*; CAPON (51) p. 351. *C. cretaceus* Sorign. sp. perhaps to be united with *C. pygmaeus* under *C. truncatus*; SCHLUETER (209) p. 118. *C. italicus*=*Infulaster* aus der Scaglia; ATHANASIU (20) p. 452. *C. minor*, distinct from *C. truncatus*; SCHLUETER (209) p. 119. *C. pseudo-italicus*, **n. sp.**, "oberen Mergel-schichten," Upper Cretaceous of Ürmös in Siebenbürgen, may be *Holaster*, *Stegaster* or *Scagliaster*, will be more fully descr. "in den Schriften der rumänischen Akademie der Wissenschaften"; SIMIONESCU (215) Verh. geol. Reichsanst. 1899, p. 231. *C. pustulifer* Peron & Gauth., based on a crushed specimen and is a *Guettaria*; GAUTHIER (102) p. 346. *C. pygmaeus* Forbes, possibly syn. of *C. truncatus*, but, if Wright's figure is correct, will stand and will be closer to *C. minor* than to French specimens usually assigned to *C. pygmaeus* (p. 116); *C. truncatus* Goldf. (sub *Spatangus*) redescr. from holotype and a second specimen from Dortmund, probably fr. Pläner-Mergel, zone of *Inoceramus labiatus*, perhaps incl. *Cardiaster pygmaeus* Forbes and *C. cretaceus* Sorignet (p. 114, pl. x): SCHLUETER (209).

†*Cassidulus*:—*C. amygdala*; FOURTAU (96) p. 663. *C. australiae*; HALL & PRITCHARD (117) pp. 49, 50.

Centrostephanus; UEXKÜLL (235).

Cidaris:—†*C.* sp.; SEMENOV (212) p. 38. †*C.* sp. indet., Mid. Trias of Tschung-tjen, China, fragments; LÓCZY (149) p. 159, pl. x. †*C. acicularis*, spines; AIRAGHI (4) p. 147. †*C. adamsi* (p. 692); †*C. avenionensis*, reference confirmed so far as spines alone permit (p. 693): FOURTAU (96). †*C. blumenbachi*, spines (p. 127); †*C. cervicalis*, spines, var. approaching *C. davoustiana* and var. with smooth sides, Rauracian, l'Yonne (p. 128, pl. i): VALETTE (237). †*C. clavigera*; KLOOS (139). *C. claviphoenix*, vide *Pseudocidaris pasqualii*. †*C. coronata*, doubtful in Rauracian of l'Yonne (p. 127); †*C. elegantulus*, **n. sp.**, Rauracian of Mailly-le-Chateau etc., Yonne, spines only, compared with *C. elegans* (p. 122, pl. i); †*C. florigemma*, spines, former confusion with *C. blumenbachi* (p. 126): VALETTE (237). †*C. gastaldii*, spine; AIRAGHI (4) p. 147. †*C. glandaria* of Egypt is Upper Cenomanian or Turonian; FOURTAU (96) p. 612. †*C.* cf. *globiceps*; KNOOP (140). †*C. granulata* (p. 127); †*C. icaunensis*, spines, redescr. (p. 132, pl. i); †*C. lineata*, spines, Cotteau's figures criticised, but specific identity of specimens from Algeria and l'Yonne admitted (p. 131); †*C. marginata*, spines (p. 124, pl. i): VALETTE (237). *C.* (*Eucidaris*) *metularia*; BELL (32) p. 134; LUDWIG (158) p. 550. †*C. propinqua*; VALETTE (237) p. 126. †*C.* aff. *sceptrifera*; KLOOS (138). †*C. spinosa*, spines, Rauracian of Mailly-le-Chateau, l'Yonne; VALETTE (237) p. 129, pl. i: perhaps a n. sp.; LAMBERT in Review. *C. tribuloides*; CLARK (56) p. 131. †*C. valfinensis*, spines, Rauracian of Mailly-le-Chateau, l'Yonne, descr. and compared with type; VALETTE (237) p. 133, pl. i. †*C. wrighti*; SEMENOV (212) p. 38.

†*Claviaster cornutus*, probably Cenomanian, probably not identical with

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specimen from Dordonian of Beaumont in Charente Inf.; FOURTAU (96) p. 627.

Clypeaster:—†*C.* spp.; BOFILL Y POCH (41) p. 412. †*C. acclivis*, specimen from Egypt. descr. and compared with *C. pentadactylus*; FOURTAU (96) p. 709, pl. iv. †*C. aegyptiacus*; FOURTAU (96) p. 200: redescr., distrib., probably incl. *C. pliocenicus* Seguenza; FOURTAU (96) p. 721. †*C. altus* Abich non Lam., discussed; GREGORY (112) p. 422. †*C. beaumontii*, measurements; AIRAGHI (4) p. 179. †*C. breunigii*; FOURTAU (96) p. 645. †*C.* (?) *breverianus* Rémond as *Echinarachnius*, redescr.; MERRIAM (175) p. 166, pl. xxi. †*C. gabbi*, vide sub *Scutella*. †*C. geneffensis*, **n. sp.**, "Helvétien II, couches à *Cl. isthmicus*," Gebel Geneffé, Egypt; GAUTHIER in FOURTAU (96) p. 705, pl. iii. †*C. guentheri*, **n. sp.**, Miocene, L. Urmi, N.W. Persia, incl. *C. turritus* Abich non Philippi and probably *C. altus* Fischer non Lam. (p. 420, pl. xxviii); †*C.* aff. *imperialis*, measured (p. 419, pl. xxviii): GREGORY (112). †*C. isthmicus*, redescr.; FOURTAU (96) p. 702. †*C. cfr. lagaides*, measurements; AIRAGHI (4) p. 154. †*C. martini*, L. Urmi, measured; GREGORY (112) p. 422. †*C. michelinii*; †*C. michelottii*, slight variation from type: AIRAGHI (4) p. 150. †*C. paronai*, n. n.; AIRAGHI (3) p. 247: **n. sp.**, Tongrian of Carcare in Bormida basin; AIRAGHI (4) Boll. Soc. geol. Ital. xviii, p. 152, pl. vi. †*C. pentalactylus* from Egypt compared with Algerian specimens; GAUTHIER in FOURTAU (96) p. 708, pl. iv. †*C. pentagonalis*, redescribed (p. 151, pl. vii); †*C. placenta*, measurements (p. 150): AIRAGHI (4). †*C. priemi*, **n. sp.**, "Helvétien II en-dessous des grès à *Ostrea vestita* et à *Echinolampas amplus*" Gebel Geneffé, Egypt; GAUTHIER in FOURTAU (96) p. 703, pl. iii. †*C. rholfsi* [err. pro *rohlfsi*]; FOURTAU (96) p. 701. *C. rosaceus*; HAECKEL (115) pl. xxx. †*C. subplacunarius*, compared with living specimens; FOURTAU (96) p. 702. †*C. taramellii*, n. n.; AIRAGHI (3) p. 247: **n. sp.**, Tongrian of Cairo Montenotte in Bormida basin; AIRAGHI (4) Boll. Soc. geol. Ital. xviii, p. 153, not figd.: why not a *Plesianthus*?; LAMBERT in Review.

†*Clypeus* (*Semi-clypeus*) *pretiosus* Mayer-Eymar referred to *Amblypygus dilatatus*; FOURTAU (96) p. 647.

†"*Codiopsis*, n. sp." Zittel, Cenomanian, Egypt; FOURTAU (96) p. 620.

†*Conoclypeus*:—*C. conoideus*; TOULA (232) p. 67: de Loriol's determination of Egyptian specimen confirmed; FOURTAU (96) p. 645. *C. delanouei*; FOURTAU (96) p. 646. *C. plagiosomus*; UGOLINI (236).

†*Coptosoma alexandri*, n. n.; AIRAGHI (3) p. 251: **n. sp.**, Aquitanian sands of Acqui in Bormida basin; AIRAGHI (4) p. 147, pl. vi: name should be *De Alexandrii*; VINASSA DE REGNY in Review [but discoverer's name is de Alessandri].

†*Coraster vilanovae*, from Transcaspian and Daghestan, descr. and measured; ANTHULA (18) p. 61, pl. ii.

†*Cyclaster archeri*; HALL & PRITCHARD (117) p. 39.

†*Cyphosoma*:—?*C.* sp.; AIRAGHI (2) p. 363. *C. abbatei*, **n. sp.**, Lower Senonian, near Ghizeh, equals the small *Pseudodiadema* of J. Walther, 1888; GAUTHIER in FOURTAU (96) p. 620, pl. i: see also FOURTAU (98) p. 193: referred by LAMBERT in Review to his genus *Heteractis*, which Gauthier does not accept. *C. choisyi*, **n. sp.**, Turonian of Gour Ouargla, Algeria; G. H. COTTEAU in ROLLAND (199) p. 46, pl. xxvii. *C.* cf. *loryi*; ANTHULA (18) p. 58.

Diadema setosum; CLARK (56) p. 131; LUDWIG (158) p. 552: as a protector of young fish; SEMON (213) p. 504.

†*Dictyopleurus haimei*, doubtful, from Mokattam, Egypt; FOURTAU (96) pp. 639, 732, & (98) p. 197.

†*Diplocidaris gigantea*, various types of spines, and a var. which *if* **n. sp.**

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is to be called *D. icaunensis*, Rauracian of l'Yonne; VALETTE (237) p. 139, pl. i.

†*Diplopodia*:—*D. sinaica* and *D. variolaris*; FOURTAU (96) p. 619.

†*Discoidea* seu *Discoides*, general scheme of periproctal plates (p. 21); *D. forgemolli*, periproctal plates (p. 22); *D. inferus* preserving plates of periproct which are descr. and figd. and shown to resemble those of *D. minimus* of which this sp. may therefore be a syn.; *D. minimus* of Michelin coll. cited by Agassiz Catal. systemat. p. 7, comes from Orcher in Gonfreville-l'Orcher (Seine-Inf.) and not from Dept. Orne (p. 21), the periproctal plates of the species (p. 22): LAMBERT in FORTIN (91). *D. pulvinata*; FOURTAU (96) p. 626. *D. subuculus*, periproctal plates; LAMBERT in FORTIN (91) p. 22.

†*Ditremaster nux*, vide sub *Hemiaster pellati*. *D. schweinfurthi* vide sub *Hemiaster*.

Dorocidaris; UEXKÜLL (235). *D. canaliculata*, from Zanzibar, fide A. Agassiz MS. label; LUDWIG (158) p. 550. *D. papillata*; †AIRAGHI (2) p. 362, pl.-f. 1: breeding period, habitat, commensals, varieties according to depth; LO BIANCO (147) p. 473.

†*Echinanthus*:—*E. camerinensis*; UGOLINI (236). *E. libycus*; FOURTAU (96) p. 652. *E. oosteri*; AIRAGHI (4) p. 156. *E. zitteli*; FOURTAU (96) p. 651.

Echinarachnius:—†*E. brewerianus*, vide sub *Clypeaster*. *E. excentricus*, Quaternary of California (p. 170, pl. xxii); †*E. gibbsi* Remond as *Scutella*, redescr. (p. 169, pl. xxii): MERRIAM (175). *E. parma*, breeding period; BUMPUS (49): effect of salt-solutions on ova; MORGAN (178) p. 496.

†*Echinobrissus*:—*E. pseudominimus*; FOURTAU (96) p. 626. *E. vincentianus*; HALL & PRITCHARD (117) p. 49.

Echinocardium:—vide etiam *Amphidetus*. The genotype should be *Spatangus atrops* Lam., which is also genotype of *Moera* Michelin; SCHLUETER (209) p. 110. †*E.* sp. nondescr., Pliocene, Egypt; FOURTAU (96) p. 723, & (98) p. 201. *E. cordatum*, distribution, habitat, habits; ALLEN (8) p. 476: breeding period, habitat; LO BIANCO (147) p. 474. *E. flavescens*, redescr. in detail, from specimens of various sizes, and compared esp. with *E. pennatifidum*; KOEHLER (141) p. 180, pl. iv. *E. mediterraneum*; CONDORELLI (61) p. 36: breeding period, habitat; LO BIANCO (147) p. 474: redescr. in detail and compared with *E. cordatum*, *E. flavescens* and *E. pennatifidum*; KOEHLER (141) p. 175, pl. iv.

†*Echinoconus*:—*E. aegyptiacus*, Upper Cenomanian or Turonian of Attaka or Abou Daragué, Egypt; FOURTAU (96) p. 626. *E. conicus*, a small rounded var.; DIBLEY (75). *E. globulus*; ANTHULA (18) p. 59. *E. magnificus*, from Gaillon, measured; FORTIN (90) p. 386.

†*Echinocorys*:—vide etiam *Ananchytes*. *E. ovatus*, cited by Zittel, from Garumnian of the Oases, but doubtful; FOURTAU (96) p. 632. *E. vulgaris*, crystallography of plates; CESÀRO (54) p. 99.

Echinocyamus pusillus; HAECKEL (115) pl. xxx: breeding period; AURIVILLIUS (21) p. 15: distribution, habitat, food; ALLEN (8) p. 474. †*E. pyriformis*, very small specimens approaching *E. affinis*; AIRAGHI (4) p. 148. †*E. thuilei*, **n. sp.**, Helvetian II, Gebel Geneffé, Egypt; GAUTHIER in FOURTAU (96) p. 696, pl. ii.

†*Echinocystis*, vide etiam sub *Protocidaris*. *E. pomum*, jaws discussed, ambulacra described and figd.; SOLLAS (216) p. 707.

Echinodiscus biforis, from Lamu and Madagascar; LUDWIG (158) p. 556.

†*Echin lampas*:—*E.* sp. non-descr. Fuchs, allied to *E. hemisphaericus* and *E. pyramidalis*; FOURTAU (96) p. 712, and (98) p. 201. †*E.* sp., Pliocene, Egypt; FOURTAU (96) p. 723. *E. affinis*, measurements and variations; AIRAGHI (4) p. 158. *E. africanus*; FOURTAU (96)

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p. 657, and (98) p. 197. *E. amplus*, variations in size (p. 711); *E. amygdala* (p. 660); *E. amygdalina* Mayer-Eymer is the *E. globulus* var. *minor* of de Loriol (p. 662): FOURTAU (96). *E. angulatus*; UGOLINI (236). *E. aschersoni*; FOURTAU (96) p. 661. *E. cassinellensis*, **n. sp.**, Oligocene, Cassinella, Piedmont, perhaps = *E. laurillardi* cited by Desor, 'Synopsis' p. 307, compared also with *E. perrieri*, *E. blainvillei*, *E. dumasi*, and *E. lovisatoi*; LORIOL (154) p. 5, pl. i. *E. cherichirensis*, **n. sp.** for specimens collected by Thomas in Tunis and hitherto referred by Gauthier to *E. perrieri*; GAUTHIER in FOURTAU (96) p. 732. *E. crameri*; FOURTAU (96) p. 661, and (98) p. 197. *E. escheri*, measurements, distinguished fr. *E. eurysomus* (p. 158); *E. eurysomus*, measurements, distinguished from *E. calvimontanus* (p. 157): AIRAGHI (4). *E. fraasi*; FOURTAU (96) p. 658, and (98) p. 197. *E. galerus*, **n. sp.**, Fumana, Vicentin; MAZZETTI (173) Mem. Pont. Acc. Lincei, v, p. 13, pl. i. *E. globulus*; FOURTAU (98) p. 197: Egyptian localities corrected; FOURTAU (96) p. 660: measurements; AIRAGHI (4) p. 159, pl. vi. *E. laurillardii* Agass. non Laube nec Wright, redescr., measurements; AIRAGHI (4) p. 161, pl. vi. *E. libycus* and *E. miniehensis* (p. 662); *E. perrieri*, redescr., Egyptian localities (p. 659): FOURTAU (96). *E. plagiosomus* Agass. non Laube; AIRAGHI (4) p. 162. *E. osiris*, type locality "Montradan" is probably Mokattam (p. 658); *E. praecedens*, very close to *E. amygdalina* (p. 663): FOURTAU (96). *E. similis*, measurements (p. 160); *E. studeri* (p. 157): AIRAGHI (4). *E. subcylindricus*; FOURTAU (96) p. 662.

Echinometra lucunter; BELL (32) p. 136; LUDWIG (158) p. 554: channels in coral-reefs; AGASSIZ (1) p. 118, pl. xxx. *E. subangularis*, colour; CLARK (56) pp. 117, 132.

†*Echinoneus artini*, **n. sp.**, Helvetian II, Gebel Geneffé, Egypt, compared with *E. thomasi*; FOURTAU (96) p. 695, pl. ii. †*E. thomasi*; GAUTHIER in FOURTAU (96) p. 696, pl. ii. *E. semilunaris*; CLARK (56) p. 132.

†*Echinopsis libycus*; FOURTAU (96) p. 640.

†*Echinospatangus cordiformis*; LAMPLUGH (144) pp. 596, 599, 602, 616.

Echinothrix desori, Zanzibar, incl. *E. calamaris* Pfeffer 1896, and *E. annellata* Peters, 1854; *E. turcarum*, Zanzibar, incl. *Diadema calamare* v. Martens 1869: LUDWIG (158) p. 553.

Echinus:—†*E.* sp.; AIRAGHI (2) p. 363. *E. acutus*; UEXKÜLL (235): pedicellariæ; UEXKÜLL (234): distribution, habitat, habits; ALLEN (8) p. 472: breeding period, habitat; LO BIANCO (147) p. 474. *E. esculentus*; BIDENKAP (38) p. 111: distribution, habitat, habits, food; ALLEN (8) p. 472: breeding period; AURIVILLIUS (21) p. 14: early development; MACBRIDE (166). †*E.* aff. *hungaricus*; AIRAGHI (2) p. 364, pl.-f. 4. †*E.* aff. *margaritaceus*; AIRAGHI (2) p. 364, pl.-f. 3: seems to LAMBERT in Review very different. *E. melo*, pedicellariæ; UEXKÜLL (234). *E. microtuberculatus*, pedicellariæ; UEXKÜLL (234): breeding period, habitat; LO BIANCO (147) p. 474: death-temperature; VERNON (241): astrosphere in immature ova; STRICHT (225 A). *E. miliaris*, distribution, habitat, habits, food; ALLEN (8) p. 474: breeding period; AURIVILLIUS (21) p. 14: early development; MACBRIDE (166). *E. verruculatus*, probably incl. "E. angulosus (Leske)" of A. Agassiz 1872 from Mozambique; LUDWIG (158) p. 555.

Encope emarginata; HAECKEL (115) pl. xxx.

†*Epiaster*:—vide etiam sub *Micraster*. *M. distinctus*; FOURTAU (96) p. 631. †*E. nutrix* nom. nud.; BOULE (45) p. 133.

Eucidaris, vide sub *Cidaris*.

†*Eupatagus* seu *Euspatangus*, redefined; GAUTHIER in FOURTAU (96) p. 678. *E. bicarinatus*, **n. sp.**, Bartonian of Poleo near Schio; MAZZETTI (172) Mem. Pont. Acc. Lincei, v, p. 12, pl. i. *E. cairensis*,

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discussed; FOURTAU (96) p. 686. *E. cor*, **n. sp.**, Bartonian of Poleo near Schio; MAZZETTI (172) Mem. Pont. Acc. Lincei, v, p. 14, pl. i. *E. coranguinum*; HALL & PRITCHARD (117) p. 50. *E.* cf. *de koninckii* incl. *E. navicella* and *Maretia grignonensis* of Botto-Micca; AIRAGHI (4) p. 176, pl. vi: neither is it *E. de koninckı* if Wright's figures are correct; LAMBERT in Review. *E. elatus*, **n. sp.** and var., Bartonian of Poleo near Schio; MAZZETTI (172) Mem. Pont. Acc. Lincei, v, p. 13, pl. i. *E. elongatus* ?, Bartonian; MAZZETTI (172) p. 16. *E. formosus*; FOURTAU (98) p. 197, redescr. with **var. nov.** *quadratus*, Lutetian I, Egypt (p. 685); *E. libycus*, redescr. (p. 687): FOURTAU (96). *E. ornatus*; AIRAGHI (4) p. 176. *E. rotundus*; HALL & PRITCHARD (117) pp. 39, 45. *E. tellinii*, **n. sp.**, Bartonian of Poleo near Schio; MAZZETTI (172) Mem. Pont. Acc. Lincei, v, p. 15, pl. i. *E. tuberosus*; FOURTAU (96) p. 686.

†*Fibularia*:—*F. acuta*, **n. sp.**, Pliocene of Ōji near Tokyo, Japan; YOSHIWARA (259) J. Geol. Soc. Tokyo, vi, p. 4. *F. lorioli*; FOURTAU (98) p. 197: redefined; FOURTAU (96) p. 641.

†*Gisopygus* **n. g.** for four spp. referred by de Loriol to *Rhynchopygus* (p. 648); viz. *G. navillei* redescr. (p. 649), *G. siutensis*, *G. thebensis*, *G. zitteli* (p. 650); FOURTAU (96): LAMBERT in Review does not see how this differs from *Plagiopygus*.

†*Gitolampas*, vide sub *Bothriolampas*.

†*Guettaria* (olim *Cardiaster*) *pustulifera* compared with *G. danglesi*; GAUTHIER (102) p. 346.

†*Hemiaster*:—*H.* sp.; MAZZETTI (172) p. 19; ŽELÍZKO (260) p. 534. *H.* sp. nondescr. aff. *H. africanus*; FOURTAU (98) p. 194. *H. africanus*?; ROLLAND (199) p. 49, pl. XXVII. *H.* (?) *aquisgranensis*, **n. sp.**, "Hornstein des Aachener Waldes," distinguished fr. *Plesiaster bucardium*; SCHLUETER (209) p. 123, pl. X. *H. archiaci*, distinguished from *H. bowerbanki*, and probably not *Trachyaster* (p. 664); *H. batnensis* (p. 629); *H. cubicus*, difference of form according to age (p. 628): FOURTAU (96). *H. fourneli*; FOURTAU (98) p. 193 and (96) p. 631. *H.* (*Periaster*) *fourtaui* Mayer Eymar, validity doubted (p. 689); *H. gracilis* ? cited by Duncan from Sinai, is perhaps not this sp. (p. 630); *H. heberti* (p. 629); *H.* (*Periaster*) *nubicus* Mayer-Eymar (p. 690); *H. pellati*, quoted by de Loriol from Mokattam, if really rightly referred, should be called *Ditremaster nux* (p. 664): FOURTAU (96). *H. planedeclivis*; HALL & PRITCHARD (117) p. 50. *H. proclivis*; FOURTAU (96) p. 630. *H. pseudo-fourneli*; ROLLAND (199) p. 49, pl. XXVII. *H. schweinfurthi* is a *Ditremaster* (p. 665); *H. wilcocksi* Mayer-Eymar, possibly *Ditremaster* (p. 689): FOURTAU (96). *H. zitteli*; ROLLAND (199) p. 49, pl. XXVII.

†*Hemicidaris*:—*H. agassizi*, spines, syn. *H. diadematα*, and *H. cartieri* (p. 145, pl. i); *H. crenularis*, spines (p. 143); *H. intermedia*, spines compared with *H. crenularis* (p. 144): VALETTE (237). *H. langrunensis*, with spines and jaws in place, Bradfordian, Lion-sur-mer; BIGOT (39) p. 67.

†*Hemipneustes italicus*; ANGELIS D'OSSAT (14) p. 64: redescr., horizon discussed; AIRAGHI (4) p. 163, pl. vii, p. 163: the sp. is certainly not a *Hemipneustes*, but genotype of *Toxopatagus* Pomel, systematic position discussed; LAMBERT in Review.

†*Heteractis* Lambert, validity doubted; GAUTHIER in FOURTAU (96) p. 622: vide etiam sub *Cyphosoma*.

Heterocentrotus trigonarius; BELL (32) p. 136.

†*Heterodiadema libycum*; FOURTAU (96) p. 618.

Hipponoë esculenta; CLARK (56) p. 132.

†*Holaster*:—vide etiam *Stegaster*. *H.* ? sp. nondescr.; TOULA (232) p. 66. *H.* sp.; ŽELÍZKO (260) p. 534. *H.* cf. *cordatus*; ANTHULA (18) p. 64.

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H. placenta? (p. 541); *H. planus* (p. 537): ŽELÍZKO (260). *H.* sp. ind. aff. *senonensis*; ANTHULA (18) p. 64.

†*Holectypus*, periproctal plates; LAMBERT in FORTIN (91) p. 22. *H. cenomanensis* and *H. crassus*; FOURTAU (96) p. 625. *H. excisus*; FOURTAU (98) p. 194 and (96) p. 624. *H. macropygus*; ANTHULA (18) p. 59.

Hypsaster, vide *Schizaster roemeri*.

†*Hypsospatangus*, redefined; GAUTHIER in FOURTAU (96) p. 678. *H. ammon* redescr., horizon doubtful; FOURTAU (96) p. 679. *H. carenatus*, **n. sp.**, Montecchio maggiore, Vicentin; MAZZETTI (173) Mem. Pont. Acc. Lincei, v, p. 9, pl. i. *H. ficheri*, subanal fasciole discussed (p. 681); *H. lefebvrei*, has it a subanal fasciole? (p. 680): FOURTAU (96). *H. peroni*, redescr.; MAZZETTI (173) p. 10, pl. i. *H. pentagonalis*, **n. sp.**; Bartonian of Poleo near Schio; MAZZETTI (172) Mem. Pont. Acc. Lincei, v, p. 10, pl. i.

Iheringiana, **nom. nov.** pro *Iheringiella* Berg, non *Iheringella* Pilsbry; BERG (35) Commun. Mus. Buenos Aires, i.

Iheringiella, **nom. nov.** pro *Iheringia* Lahille 1898, non Keyserling 1891; BERG (34) p. 16.

Iheringina **nom. nov.** pro *Iheringia* Lahille non Keyserling [preocc. autem *Iheringiana* q.v.]; LAHILLE (143) p. 395.

†*Inflaster* **n. g.** with genotype *H. abichi*, **n. sp.**, Senonian, Daghestan, allied to *Offaster*; ANTHULA (18) p. 62, pl. ii.

†*Lambertia*, **n. g.** of *Spatangidæ*, group *Breyninae*, with genotype *L. gardinalei*, **n. sp.**, Priabona Beds, near Lonigo, Vicenza, Italy; OPPENHEIM (186): discussed by LAMBERT in Review. [Nom. preocc. Desvoidy, 1863.]

†*Lampadaster gauthieri*; BOULE (45) p. 130.

Leiocidaris:—†*L. australis*; HALL & PRITCHARD (117) pp. 47, 50. *L. baculosa* (p. 551); *L. imperialis*, incl. *Cidaris dubia* Brandt and *C. fustigera* A. Ag. (p. 552); *L. verticillata* (p. 551): LUDWIG (158).

†*Leiopedina* sp.; AIRAGHI (2) p. 362, pl.-f. 2.

†*Lepidechinus rarispinus*, development of interambulacra; JACKSON (127) p. 132.

†*Lepidesthes*, compared with *Pholidocidaris*, *Perischodomus*, and *Hybechinus* (p. 199); *L. devonicans*, Pilton Beds, N. Devon, in Mus. Pract. Geol., and from Croyde in Whidborne coll. now first descr. and figd. (p. 200, pls. xxiv, xxv): WHIDBORNE (250).

†*Linthia*:—*L.* sp.; MAZZETTI (172) p. 18. *L. aschersoni* and *L. arizensis*; FOURTAU (96) p. 671. *L. capellinii*; AIRAGHI (4) p. 165. *L. cavernosa* (p. 670); *L. delanouei* (p. 669); *L. esnehensis* (p. 671); *L. hessi* Mayer-Eymar (p. 690); *L. latisulcata* (p. 670): FOURTAU (96). *L. lorioli*, n. n.; AIRAGHI (3) p. 249: **n. sp.**, Tongrian of Carcare in Bormida basin; AIRAGHI (4) Boll. Soc. geol. Ital. xviii, p. 166, pl. vii. *L. navillei*, validity of species confirmed by subsequent finds; FOURTAU (96) p. 670. *L. nipponica*, **n. sp.**, Tertiary of Kanazawa and Sakae, Japan; YOSHIWARA (259) J. Geol. Soc. Tokyo, vi, p. 2. *L. nobilis*, **n. sp.**, Colli Berici, Vicenza; MAZZETTI (173) Mem. Pont. Acc. Lincei, v, p. 12, pl. i. *L. oblonga*, the locality Gebel Garèbe given by the collector Lefèbvre to d'Orbigny is unknown; FOURTAU (96) p. 631.

†*Lovenia*:—*L.*? sp., Miocene of Gebel Geneffé, Egypt; FOURTAU (96), p. 720. *L. forbesi*; HALL & PRITCHARD (117) pp. 39, 49.

†*Macropneustes*, general discussion of the group of allied genera; definition of genus (p. 677). *M. schweinfurthi* Mayer-Eymar, perhaps not a *Macropneustes* (p. 691); *M. sickenbergeri* Mayer-Eymar, discussed, possibly a *Megapneustes* (p. 691); *M. similis* Mayer-Eymar, apparently accepted (692): FOURTAU (96).

†*Maretia*:—*M. depressa*; FOURTAU (96) p. 688. *M. pareti*; AIRAGHI (2)

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p. 375 pl.-f. 10. *M. pendula*, horizon and locality of type discussed; FOURTAU (96) p. 688.

†*Megapneustes* **n. g.** with genotype *M. grandis*; GAUTHIER in FOURTAU (96) p. 678; LAMBERT in Review points out resemblance to *Stomoporus*. *M. crassus*, redescr.; FOURTAU (96) p. 684. *M. grandis*, **n. sp.**, Upper Suessonian of Gebel Drounka near El-Syout; GAUTHIER in FOURTAU (96) p. 681, pl. ii.

Mellita sexforis, colour; CLARK (56) pp. 117, 132.

†*Melonechinus*, vide sub *Melonites*.

†*Melonites* preocc. Lamarck, 1827, for *Foraminifer*, replaced by *Melonechinus*, Meek & Worthen, 1866; LAMBERT in Review of JACKSON (127). *M. multiporus*, variations in interambulacra; JACKSON (127) p. 131.

Mespilia globulus; BELL (32) p. 135.

Metalia sternalis, Aldabra Id.; LUDWIG (158) p. 556: ? Funafuti; HEDLEY (118 A) p. 530.

†*Metaporhinus* sp.; SEMENOV (212) pp. 39, 80.

†*Micraster*:—*M.* sp.; ŽELÍZKO (260) pp. 537, 543. *M.* sp. Zittel, Aturian, Egypt; FOURTAU (96) p. 632. *M. arenatus*; RIAZ (198) pp. 418, 425. *M. breviporus*; ANTHULA (18) p. 65: the type-cast is a young *M. coranguinum*; ROWE (202) p. 525. *M. brongniarti*, var. *sismondae*, is not *M. glyphus* Schlüt.; RIAZ (198) p. 417. *M. cor-anguinum*, high-crested form; DIBLEY (75): discussed; ROWE (202) p. 538, pls. XXXV–XXXVII: var. *latior*, **n. var.**; ROWE (202) p. 539, pls. XXXV–XXXVII. *M. cor-bovis*, redescr., with formae *gibbosa*, *carinata*, *planidorsata*, et *normanniae*, neanic stage, and passage-forms to *M. leskei*; ROWE (202) pp. 518–524, pls. XXXV, XXXVIII, XXXIX. *M. cormarinum*, first occurrence in Normandy, description and comparison with *M. coranguinum* and allies and *M. glyphus*; LAMBERT in FORTIN (89) p. 358, pl. ii [see under II, A, iii]. *M. cor-testudinarium* Goldf. discussed, and *M. cor-testudinarium* Auctt., redescr., with formae *gibbosa*, *carinata*, *planidorsata*, *normanniae*, et *beonensis* (p. 534, pl. XXXV); *M. decipiens*, discussed (pp. 534, 535): ROWE (202). *M.* cf. *de lorioli*; ŽELÍZKO (260) p. 534. *M. gibbus*; ATHANASIU (20) p. 452; RIAZ (198) p. 417. *M. gosseleti*, discussed; ROWE (202) p. 535. *M. heberti*; RIAZ (198) p. 428. *M. intermedius*, discussed; ROWE (202) p. 537. *M. leskei*, RIAZ (198) p. 428: redescr., with formae *gibbosa*, *carinata*, *planidorsata*, *normanniae*, et *beonensis*, and passage-form to *M. praecursor*; ROWE (202) p. 525, pls. XXXV, XXXVI, XXXVIII. *M. praecursor*, **nom. nov.**, a group of individuals occurring in the Chalk of S. England from zone of *Holaster planus* to the lower third of *M. cor-anguinum* zone, "even in its restricted sense, it cannot rightly be called a species"; ROWE (202) pp. 496, 530, pls. XXXV, XXXVI, XXXVII. *M. turonensis*, discussed; ROWE (202) p. 535. *M.* (*Epiaster*) *ultimus* Mayer-Eymar, validity doubted; FOURTAU (96) p. 689.

†*Micropsis*:—*M. fraasi* (p. 639); *M. mokattamensis* (p. 640): FOURTAU (96).

†*Mistechinus*, validity of genus doubted (p. 641); *M. mayeri* de Loriol, the types are young, an older specimen discovered near Minieh (p. 732): FOURTAU (96).

Moera Michelin, v. sub *Echinocardium*.

†*Myriastiches*, **n. g.** of *Cystocidaroida* (?), with genotype *M. gigas*, **n. sp.**, Lower Ludlow limestone, England, and forming *Myriastichidae*, **n. fam.**; SOLLAS (216) pp. 700, 701 and fig. 5.

†*Nucleolites luynesi*; FOURTAU (96) p. 627.

†*Offaster globulosus*; BONARELLI (42) p. 1020.

†*Oligoporus*:—*O.*? *minutus*, **n. sp.**, Deer Creek limestone, Coal measures, N.E. of Topeka, Kansas; BEEDE (30) Kansas quart. viii, p. 126. *O. missouriensis*, variations in interambulacra; JACKSON (127) p. 131.

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†*Opissaster thebensis*; FOURTAU (96) p. 676.

†*Orthopsis*:—*O. miliaris*; FOURTAU (98) p. 194. *O. rupellii* de Lor., believed to be Cretaceous of Sinai, probably Cenomanian, and not Nummulitic of Mokattam; FOURTAU (96) p. 619.

†*Palaeodiscus ferox*, jaws and ambulacra described and figd.: SOLLAS (216) p. 701.

†*Palaeostoma zitteli*; FOURTAU (96) p. 665.

†*Paropsonema*, nom. nud.; CLARKE (60).

†*Pedina sinaica* Desor, doubtful if from Cretaceous of Sinai; FOURTAU (96) p. 619.

Periaster, vide etiam sub *Hemiaster*. †*P. elatus*; FOURTAU (96) p. 631.

†*Pericosmus*:—*P. aequalis*; AIRAGHI (4) p. 173. *P. lyonsi*, **n. sp.**, "Helvétien II, Couches à Pecten Malvinae." Gebel Geneffé, G. Aouebet, G. Damasq, Egypt; GAUTHIER in FOURTAU (96) p. 716, pl. iv. *P. marianii*, n. n.; AIRAGHI (3) p. 251: **n. sp.**, Aquitanian of R. Ravanasco in Bormida basin; AIRAGHI (4) Boll. Soc. geol. Ital. xviii, p. 175, pl. vii. *P. paronai*, n. n.; AIRAGHI (3) p. 250: **n. sp.**, Tongrian of Cassinelle in Bormida basin, based on *P. edwardsi* var. *minor* Botto-Micca; AIRAGHI (4) Boll. Soc. geol. Ital. xviii, p. 174, pl. vi. *P. pasqualii*, **n. sp.**, Lutetian II, Mokattam, allied to *P. spatangoides*, type in Pasquali coll.; GAUTHIER in FOURTAU (96) p. 672, pl. ii. *P. peroni*, measurements (p. 174); *P. spatangoides* (p. 173, pl. vii): AIRAGHI (4).

Phormosoma hoplacantha, evidence for bipolarity; THOMPSON (230) p. 319.

Phyllacanthus annulifera, Zoanthid incrusting spines (p. 134); *P. gigantea*, (p. 135); *P. imperialis* (p. 135): BELL (32).

Phymosoma d'Arch. & Haime non Quatrefrages. †*P. radiatum*; ŽELÍZKO (260) pp. 534, 541.

†*Plagiopygus*, vide sub *Gisopygus*.

Plesianthus, vide *Clypeaster taramellii*.

†*Plesiaster*:—*P. bucardium* Goldf. (sub *Spatangus*), redescr. fr. holotype and topotypes (p. 119, pl. ix); *P.? parvistella*, **n. sp.**, "Hornstein des Aachener Waldes," separated from *P. bucardium* (p. 121, pl. ix): SCHLUETER (209).

†*Plesiospatangus* Pomel, accepted as genus and redefined; GAUTHIER in FOURTAU (96) p. 678; LAMBERT in Review suggests union with *Brissospatangus* Cott. 1863. *P. cotteaui*; FOURTAU (96) p. 687: apical system; GAUTHIER (102) p. 344, text-fig. 1.

†*Pliolampas*, descended from *Echinanthus* and are Miocene; GAUTHIER in FOURTAU (96) p. 653. *P. pioti*, **n. sp.**, "Helvétien II, couches au-dessous du niveau des Heterostegina" Gebel Geneffé and Gebel Aouebet, Egypt; GAUTHIER in FOURTAU (96) p. 712, pl. iii.

†*Porocidaris schmideli*; FOURTAU (98) p. 197: Egyptian localities, those of Mayer-Eymar corrected; FOURTAU (96) p. 638.

Pourtalesia phiale, evidence for bipolarity; THOMPSON (230) p. 318.

†*Prenaster* (*?*) *carinatus*, **n. sp.**, Senonian, Daghestan; ANTHULA (18) p. 65, pl. ii.

†*Protocidaris*, **n. g.** of *Archaeocidaridæ*, compared with *Archaeocidaris*, *Eocidaris*, and *Lepidocidaris* (p. 202): with genotype *P. acuaria* Whidb. (sub *Eocidaris?*), Pilton beds, E. of Barnstaple, type in Mus. Pract. Geol., compared with *Cidaris laevispina* Sandberger (p. 203, pl. xxv); WHIDBORNE (250). *P.* sp. [Ludlow beds?], Leintwardine, possibly this genus is a large *Echinocystis*; SOLLAS (216) p. 709.

†*Psammechinus*:—*P. affinis* var. *depressa* (p. 693); *P. dubius*, cited by Rothpletz from Ouady Etal, Sinai, where however no Miocene exists (p. 694); *P. monilis*, apparently an *Arbacina* (p. 694): FOURTAU (96). *P. woodsi*; HALL & PRITCHARD (117) p. 48.

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†*Pseudocidaris pasqualii*, **n. sp.**, Upper Cenomanian drift near Cairo, type in Pasquali coll., possibly belongs to *P. dieneri* de Loriol, and resembles *Radiolus glandarius clavophoenix* Quenst.; GAUTHIER in FOURTAU (96) p. 613, pl. i. LAMBERT in Review considers it inseparable from *Cidaris claviphoenix* Quenst.

†*Pseudodiadema*:—*P.* sp. Zittel, Cenomanian, Egypt; FOURTAU (96) (p. 616). *P. meunieri*, **n. sp.**, "Cenomanien, Calcaires gréseux à *Sphaerulites Schweinfurthi* Zitt. Ouady Mohr," Egypt; GAUTHIER in FOURTAU (96) p. 617, pl. i.

†*Pygorhynchus*:—*P. abundans* Mayer-Eymar [nom. nud. on p. 43 of (224) Zool. Rec. 1897] descr. and referred to n. g. *Bothriolampas*; GAUTHIER in FOURTAU (96) p. 655. *P. grandiflorus*; FOURTAU (96) p. 651.

†*Pygurus*:—*P. noetlingi*, **n. sp.**, Cenomanian (?) of Keft-Akab, Ouadi Sanin, Lebanon; LORIOL (154) p. 4, pl. i. *P. nummuliticus* Mayer-Eymar is a fragment of an *Euspatangus*; FOURTAU (96) p. 652.

†*Pyrina desmoulinsii*; ANTHULA (18) p. 59.

†*Rhabdocidaris*:—*R. censoriensis*, spines; VALETTE (237) p. 137. *R. crameri*, Senonian near Ghizeh, probably incl. the '*Cidaris* cf. *cyathifera*' and the '*C. subvesicularis*' of J. Walther, 1888; FOURTAU (96) p. 615. *R. itala*; FOURTAU (96) p. 633 and (98) p. 197. *R. lorioli* "Mayer-Eymar (in collect.)" presumably **n. sp.**, Middle Suessonian of Dounkoun and Kourkour, Egypt, based on spines only; FOURTAU (96) p. 636, pl. i. *R. megalacantha*, is this rightly recorded from Rauracian of l'Yonne?; VALETTE (237) p. 134. *R. miniehensis*, quoted as "Mayer Eymar, 1897" but this appears to be only MS label, so that it is **n. sp.**, Lutetian 1 b, Minieh, Egypt, allied to *R. zitteli* and *R. pouechi*; GAUTHIER in FOURTAU (96) p. 634, pl. i. *R. nobilis*, spine from Rauracian of Mailly-le-Chateau, l'Yonne, descr. and compared with *R. orbignyana* (p. 135, pl. i); *R. orbignyana*, spines (p. 137): VALETTE (237). *R. pouyannei*; ROLLAND (199) p. 55, pl. xxvii, p. 78. *R. ritteri*, spines; VALETTE (237) p. 138. *R. solitaria* "Mayer-Eymar, 1898," no reference, therefore presumably **n. sp.**, Lutetian 1, Mokattam, approaches *Cidaris taramelli*, type a single spine at Zurich, not figd. (p. 637); *R. zitteli*, redefined (p. 635): FOURTAU (96).

†*Salenia batnensis*, Cenomanian, Egypt; FOURTAU (96) p. 616.

Salmacis? *elegans*, **n. sp.**, New Britain, "though at first sight it appears to be a Cidaroid, it is certainly a Triplechinid"; BELL (32) p. 135, pl. xvii.

†*Scagliaster*:—*S.* sp.; BONARELLI (42) p. 1022, pl.-f. 6: is a true *Stegaster*, but sp. nondescr.; LAMBERT in Review. *S. italicus*; BONARELLI (42) p. 1022, pl.-f. 1: probably = the *Stegaster* cf. *subtrigonatus* of Bonarelli, and is a *Cardiaster*; LAMBERT in Review.

Schizaster:—†*S.* sp.?, Miocene of Gebel Geneffé, Egypt; FOURTAU (96) p. 717. †*S.* sp. ind.; AIRAGHI (4) p. 172. †*S. acuminatus*; BÖCKH (40) p. 13, pl. ii. †*S. africanus*; FOURTAU (96) p. 674. †*S. ambulacrum*, measurements (p. 166); †*S. corsicus*, smaller than topotypes (p. 171); †*S. desori*, affinities with *S. laubei* and *S. parkinsoni* (p. 170): AIRAGHI (4). †*S. foveatus*; FOURTAU (96) p. 675. *S. fragilis*; BIDENKAP (38) p. 112. †*S. gaudryi*; FOURTAU (96) p. 674. †*S. globulosus*, **n. s.**, Pliocene of S. Colombano in Lombardy; AIRAGHI (2) p. 375, pl.-f. 9. †*S. indigenus* Mayer-Eymar, apparently accepted (p. 690); †*S. jordani* (p. 676): FOURTAU (96). †*S. le contei*, **n. sp.**, Martinez beds, Contra Costa co., Cal.; MERRIAM (175) p. 164, pl. xxi. †*S. major* (p. 372); †*S. mariani*, **n. sp.**, Pliocene of S. Colombano in Lombardy (p. 374, pl.-f. 8): AIRAGHI (2). †*S. mokattamensis*; FOURTAU (96) p. 675, and (98) p. 197. †*S. mongei* Mayer-Eymar, apparently accepted; FOURTAU (96) p. 960. †*S. rana*, **n. sp.**, Castel-

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vecchio vicentino; MAZZETTI (173) Mem. Pont. Acc. Lincei, v, p. 10, pl. i. †*S. recticanalis*, **n. sp.**, Tertiary, bank of Saigawa at Kanazawa in Kaga, Japan; YOSHIWARA (259) J. Geol. Soc. Tokyo, vi, p. 3. †*S. rimosus*, slight variations from forms previously descr.; AIRAGHI (4) p. 170. †*S. roemeri* is probably a *Hypsaster*; LAMBERT in Review of FRIC (91) Zool. Rec. 1897. †*S. rohlfsi*; FOURTAU (96) p. 675. †*S. scillae*; AIRAGHI (2) p. 372: incl. *S. bellardii* Michelotti; AIRAGHI (4) p. 172. †*S. studeri*, redescr., measurements, incl. specimens referred by Botto-Micca to *S. diulfensis*?; AIRAGHI (4) p. 167, pl. vii: probably not *S. studeri*; LAMBERT in Review. †*S. vicinalis*, measurements; AIRAGHI (4) p. 169. †*S. zitteli*; FOURTAU (96) p. 674.

†*Scutella*:—*S. ammonis*; FOURTAU (96) p. 698. *S. faujasi*, with 4 ambulacra; KERFORNE (134). *S. gabbi* Rémond as *Clypeaster*, redescr.; MERRIAM (175) p. 168, pl. xxii. *S. gibbsi*, see *Echinarachnius*. *S. innesi*, **n. sp.**, Helvetian II "Grès à *Echinolampas amplus* et *Ostrea vestita*," between Gebel Geneffé and railway station; GAUTHIER in FOURTAU (96) p. 699, text-fig. *S. interlineata*, redescr.; MERRIAM (175) p. 168, pl. xxii. *S. rostrata*; FOURTAU (96) p. 698. *S. striatula*, differences from *S. subrotunda*, to which the specimens were referred by Michelotti; AIRAGHI (4) p. 154, pl. vi: certainly not *S. striatula*; LAMBERT in Review. *S. subrotunda*; AIRAGHI (4) p. 154. *S. zitteli*, FOURTAU (96) p. 699.

†*Scutellina patella*; HALL & PRITCHARD (117) pp. 39, 45, 49.

Semiclypeus, vide sub *Amblypygus*.

Sismondaea versus *Sismondia*, spelling discussed; FOURTAU (96) p. 644.

†*Sismondia*:—*S. logotheti* (p. 642); *S. macrophylla* Mayer-Eymar (as *Sismondaea* [vide Zool. Rec. 1898]) "bien aventureux d'établir une n. sp. de *Sismondia* sur un seul exemplaire de petite taille" (p. 644); *S. planulata* cited by Fraas from Mokattam may be *S. saemanni* (p. 643); *S. zitteli* Mayer-Eymar (as *Sismondaea* [vide Zool. Rec. 1898]) accepted (p. 644): FOURTAU (96).

Spatangus arcuarius Goldf. 1826, examination of the original specimen, which is not a fossil, but referable to the recent *Amphidetus cordatus* Penn. sp.; SCHLUETER (209) p. 104. †*S. bucardium* Goldf., vide *Plesiaster bucardium* et *parvistella*. †*S. corsicus*; AIRAGHI (4) p. 177. †*S. hieroglyphicus* Jos. Müller, distinguished from *Plesiaster bucardium* et *parvistella*; SCHLUETER (209) p. 122. †*S. pantanellii*, **n. sp.**, Bartonian of Poleo near Schio; MAZZETTI (172) Mem. Pont. Acc. Lincei, v, p. 8, pl. i. *S. purpureus*, distribution, habitat, habits, commensal; ALLEN (8) p. 475: Müll. non Lam., Veronese; †MAZZETTI (173) p. 14. †*S. truncatus* Goldf., vide *Cardiaster*.

Sphaerechinus; UEXKÜLL (235). *S. granularis*, pedicellariæ; UEXKÜLL (234): breeding period, habitat; LO BIANCO (147) p. 474: crossed with *Strongylocentrotus*; VERNON (240): astrosphere in immature ova; STRICHT (225 A).

†*Stegaster*:—vide etiam sub *Scagliaster*. *S. caucasicus*, descr. and measured; ANTHULA (18) p. 63, pl. ii. *S.* cf. *planus*; BONARELLI (42) p. 1022, pl.-f. 5: is not a *Stegaster*; LAMBERT in Review. *S. subtrigonatus* and var.; BONARELLI (42) p. 1021, pl.-ff. 2, 3, 4: cannot be a *Stegaster* in sense of Seunes, or even of Pomel, but probably a *Cardiaster*; LAMBERT in Review.

†*Stenonia tuberculata*; BONARELLI (42) p. 1020; SIMIONESCU (215) p. 231.

†*Stirechinus* sp.; AIRAGHI (2) p. 365, pl. – f. 5.

†*Stomoporus*, vide sub *Megapneustes*.

Strongylocentrotus droebachiensis; BIDENKAP (37) p. 100, and (38) p. 111: development of interambulacrals; JACKSON (127) p. 129, figg. 112–116. †*S. drasbachiensis* [sic]; AIRAGHI (2) p. 365, pl.-f. 6: pores are different, LAMBERT in Review. *S. lividus*, dissection, very popular;

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GRUVEL (113): breeding period, habitat; Lo BIANCO (147) p. 474: effect of staleness of gonads; VERNON (240): death-temperature; VERNON (241): pedicellariæ; UEXKÜLL (234). *S. pallidus*; BIDENKAP (38) p. 112.

Temnopleurus, juv.; BELL (32) p. 135. *T. toreumaticus* (apud de Loriol) or *japonicus* (apud v. Martens), at Delagoa; JUNOD & GODET (131) p. 281.

†*Thagastea luciani* de Lor. as *Echinocyamus*, but has no internal septa; FOURTAU (96) p. 642.

†*Tornquistellus* **nom. nov.** pro *Leptechinus* Tornquist non Gauthier; BERG (36) Comun. Mus. Buenos Aires, i, p. 77.

†*Toxaster*:—*T. collegnii*; ANTHULA (18) p. 65. *T. complanatus*; ANTHULA (18) p. 65; MAAS (163) p. 249: see *Echinospatangus cordiformis*; LAMPLUGH (144). *T. gibbus*; ANTHULA (18) p. 65.

†*Toxobrissus lorioli* Bittner, vide sub *Brissopsis*.

†*Toxopatagus*, vide sub *Hemipneustes italicus*.

Toxopneustes variegatus; CLARK (56) p. 132.

(D.)—ASTEROIDEA.

Classification of *Ast.* based on Sladen, with emendations of detail based on E. Perrier; HAMANN (118) pp. 666–719. General revision of Palæozoic *Ast.*, and distribution between *Phanerozonia* and *Cryptozonia*; GREGORY (111).

Achanthaster echinites; BELL (32) p. 138.

Acodontaster, **n. g.** with genotype *Gnathaster elongatus* Slad., and incl. *G. miliaris* Gray; VERRILL (243) p. 204.

Antheniaster, **n. g.** with genotype *Anthenoides sarissa* Alcock; VERRILL (243) p. 173.

Anthenoides sarissa, see *Antheniaster*.

Aphroditaster gracilis; VERRILL (243) p. 195.

Archaster bairdi, see *Mediaster*. *A. parelii*, see *Pseudarchaster intermedius* and *P. fallax*.

Archasteridae broken up into *Odontasteridae*, *Plutonasteridae*, *Goniopectinidae*, *Benthopectinidae* (all which are *Valvata*) and *Archasteridae* = *Archaster* (which are *Paxillosa*); VERRILL (243) p. 199.

†*Argaster*, maintained in *Palaeasterinae*, with genotype *Asterias antiqua* Troost; GREGORY (111) p. 345.

†*Aspidosoma*, maintained, with genotype *A. arnoldi*; GREGORY (111) p. 351.

†*Aspidosomatidae*, diagnosed, as fam. of *Phanerozonia*; GREGORY (111) p. 351.

Asteracanthion rubens, dissection, very popular; GRUVEL (113).

Asterias sp. cf. *muelleri*, in Tromsö Sound, perhaps young of some Arctic form, measurements and preliminary description; BIDENKAP (38) p. 108. †*A. antiqua* Hisinger 1837 non Troost 1835, see *Lindstromaster*. †*A. antiqua* Troost 1835 non Hisinger 1837, see *Argaster*. *A. forbesi*, popular account, economics, and development; FIELD (86): life-history and bionomics, with special reference to protection of oysters; MEAD (174): effect of salt-solutions on ova; MORGAN (178) p. 499. *A. glacialis*; BIDENKAP (37) p. 99, and (38) p. 108: breeding period; AURIVILLIUS (21) p. 12: breeding period, habitat; Lo BIANCO (147) p. 470: distribution, habitat, habits, food; ALLEN (8) p. 466: pedicellariæ; UEXKÜLL (234) p. 354. *A. muelleri*; BIDENKAP (37) p. 99, and (38) p. 108. *A. pallida*, Goto's account of development criticised; MACBRIDE (164). *A. rubens*; HAECKEL (115) pl. xl; BIDENKAP (37) p. 99, and (38) p. 108: breeding period; AURIVILLIUS (21) p. 11: distribution, habitat, habits, food; ALLEN (8) p. 465:

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migrates from deep to shallow water at breeding period; SEMON (213) p. 507. *A. stellionura*, with *r* 14 mm. and *R* 120 mm., in Lyngenfjord; BIDENKAP (37) p. 99. *A. tenuispina*; CLARK (56) p. 130: breeding period, fissiparity, habitat; LO BIANCO (147) p. 470. *A. vulgaris*, bionomics etc. as under *A. forbesi*; MEAD (174).

Asterina cepheus, colour in life; LUDWIG (158) p. 541. *A. exigua*; BELL (32) p. 137. *A. folium*; CLARK (56) p. 130. *A. gibbosa*; CONDORELLI (61) p. 34: breeding period, and var. *pancerii*, breeding period, habitat; LO BIANCO (147) p. 470.

Asterodon; VERRILL (243) p. 203.

Asteropsis pulvillus, breeding period; AURIVILLIUS (21) p. 12.

Astrogonium M. & Tr. is a name of no validity; VERRILL (243) pp. 147, 149. *A. annectens*, *A. aphrodite*, *A. hystrix*, *A. necator*: vide sub *Pseudarchaster*.

Astropecten andromeda in Tromsö Sound, measurements; BIDENKAP (38) p. 107. *A. aurantiacus*, breeding period, habitat, food (p. 470); *A. bispinosus*, breeding period, habitat, food (p. 471): LO BIANCO (147). *A. inermis*, **n. sp.**, Madagascar, allied to *A. granulatus* and *A. cingulatus*; LORIOL (154) p. 14, pl. ii. *A. irregularis*, distribution, habitat, habits, food, commensal; ALLEN (8) p. 461. *A. kagoshimensis*, **n. sp.**, Kagoshima, Japan, compared with *A. javanicus*, *A. orsinii*, *A. tamilicus* and *A. scoparius* (p. 25, pl. ii); *A. koehleri*, **n. sp.**, Pondicherry, somewhat allied to *A. andersoni*, *A. scoparius*, *A. indicus* and *A. tamilicus* (p. 19, pl. i); *A. ludwigi*, **n. sp.**, Tago, Japan = specimen figd. by J. E. Ives [not Yves] 1891, 1892, as *A. japonicus*, compared with the true *A. japonicus* and *A. pontoporaeus* (p. 21, pl. ii): LORIOL (154). *A. monacanthus*; BELL (32) p. 136. *A. penangensis*, **n. sp.**, Penang, Malacca Peninsula, allied to *A. andersoni*, and compared with *A. capensis*, *A. javanicus* and *A. scoparius*; LORIOL (154) p. 7, pl. i. *A. pentacanthus*, breeding period, habitat, food; LO BIANCO (147) p. 471. *A. rubidus*, **n. sp.**, Mexico, allied to *A. articulatus* Say (sensu Lütken & Ives [not Yves]), and compared with *A. variabilis* (p. 16, pl. ii); *A. verrili* [sic], **n. sp.**, Mazatlan, allied to *A. indicus* and *A. fragilis*, and compared with *A. monacanthus* (p. 12, pl. ii); *A. zebra*, small specimens from Sumatra, fully descr. and compared with adult, the sp. incl. *A. coppingeri* (p. 9): LORIOL (154).

Benthopecten spinosus, incl. *Pararchaster semisquamatus* var. *occidentalis* Slad. and *P. armatus* Slad.; VERRILL (243) p. 217, pl. xxx.

Benthopectinidae, **n. fam.** = *Benthopectininae* Verrill 1894; VERRILL (243) p. 200.

Bipinnaria asterigera (larva of *Luidia sarsi*); NORDGAARD (182) p. 14: coast of Norway, February to October; NORDGAARD (181) p. 20.

Blakiaster conicus, notes, pedicellariæ; VERRILL (243) p. 218, pl. xxvii.

Calliaster Gray 1840, maintained with genotype *C. childreni*; VERRILL (243) p. 149.

Ceramaster s.-g. of *Tosia* (q.v.); VERRILL (243) p. 161.

Chaetaster longipes, breeding period, habitat; LO BIANCO (147) p. 471.

Cladaster, **n. g.**, with genotype *C. rudis*, **n. sp.**, 440 fms., off Florida; VERRILL (243) p. 175, pl. xxviii.

Craspedaster, perhaps belongs to *Goniopectinidae*; VERRILL (243) p. 201.

Cryptozonia, extended to Palaeozoic *Ast.*; GREGORY (111) p. 343.

Ctenodiscus crispatus; BIDENKAP (37) p. 100, and (38) p. 109. *C. krausei* is probably syn. of *C. corniculatus*; DOEDERLEIN (78) p. 337.

Culcita sp., plates of dorsal surface imbricate, enlarged oral and aboral views; BELL (32) p. 137. *C. schmideliana* var. *africana*; LUDWIG (158) p. 538.

†*Dermaster*, **n. g.**, erected for *D. boehmi*, **n. sp.**, Vögisheim near Mullheim

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in Baden, Bathonian "Ferrugineus-Schichten," ventral surface unknown; LORIOL (155).

Dorigona Gray 1866 is syn. of *Ogmaster* Martens, but *Dorigona* Perrier 1894 is syn. of *Nymphaster* Sladen; VERRILL (243) p. 185.

Dytaster exilis, evidence for bipolarity; THOMPSON (230) p. 320.

Echinaster eridanella; BELL (32) p. 138. *E. purpureus*; l. c.: Zanzibar; LUDWIG (158) p. 543. *E. sepositus*, breeding period; LO BIANCO (147) p. 741.

†*Encrinasteriae*, rejected; GREGORY (111) p. 342.

†*Etheridgaster*, **n. g.** of *Lepidasteridae* with genotype *Palaeaster clarkei* De Kon.; GREGORY (111) p. 353.

Euasteroidea, rejected; GREGORY (111) p. 342.

Eugoniaster, **n. g.**, with genotype *Pentagonaster investigatoris* Alcock; VERRILL (243) p. 172.

Fromia milleporella; BELL (32) p. 138.

Gnathaster, restr. with genotype *G. meridionalis*, and incl. *G. pilulatus*; VERRILL (243) pp. 203, 204. *G. elongatus* and *G. miliaris*, vide *Acodontaster*.

Gnathasterinae, vide *Odontasteridae*; VERRILL (243) p. 203.

Gnathodon, errore pro *Gnathaster*; VERRILL (243) p. 203.

Goniaster Perrier et Sladen, non Agassiz nec Gray, vide *Pseudoreaster*. History of the name (p. 147), retained sensu Gray, with genotype *G. cuspidatus*, and with *Phaneraster* Perrier as syn. (p. 150); VERRILL (243). †*G.* sp., probably = *Astropecten spongiarum* Eug. Deslongchamps, Bradfordian, Lion-sur-mer; BIGOT (39). *G. africanus*, maintained (p. 156); *G. americanus*, pedicellariæ and spines of holotype descr., variations fr. type in Florida and W. Indian specimens, incl. *Pentagonaster parvus* Perrier as young, also *P. semilunatus* Perr. pars (p. 151, pl. xxiv *a*, xxvi); *G. lamarcki*, maintained (p. 157): VERRILL (243).

Goniasteridae, revised; VERRILL (243) p. 145.

Goniasterinae, **n. subfam.** of *Goniasteridae*, = *Pentagonasterinae* Slad. pars; VERRILL (243) p. 200.

Goniodiscus M. & Tr., retained sensu Perrier, with genotype *G. cuspidatus* (Lam.) (p. 149); *G. pedicellaris* Perrier referred with doubt to *Mediaster* (p. 182): VERRILL (243).

Goniodon; VERRILL (243) p. 203.

Goniopecten demonstrans, sole representative of genus, redescribed; VERRILL (243) p. 213, pl. xxvii.

Goniopectinidae, **n. fam.** for *Goniopecten* restr., *Prionaster*, n. g. and ? *Craspedaster*; VERRILL (243) pp. 200, 213.

Gymnasterias carinifera; BELL (32) p. 137.

Hacelia attenuata, breeding period, habitat; LO BIANCO (147) p. 471.

Henricia sanguinolenta; BIDENKAP (38) p. 108: one with *r* 18·5 mm. and *R* 59 mm.; BIDENKAP (37) p. 99: distribution, habitat, habits; ALLEN (8) p. 465.

Hexaster obscurus Perrier 1891 = *Pteraster* (*Temnaster*) *hexactis* Verrill 1894; VERRILL (243) p. 221.

Hippasteria Gray 1840, maintained with genotype *H. phrygiana* (p. 148); *H. caribaea*, **n. sp.**, 268 fms., 'Albatross' Station 2668, W. Indies (p. 174, pl. xxviii): VERRILL (243).

Hippasteriinae, **n. subfam.** of *Goniasteridae*; VERRILL (243) p. 174.

Hoplaster, relations uncertain (p. 197); *H. lepidus* (p. 198); *H. spinosus* (p. 197): VERRILL (243).

Hosia Gray 1840, had genotype *H. flavescens*, which is an *Anthenea*, while *H. spinulosa* is "probably an immature species of *Tosia*, or of some closely related genus"; VERRILL (243) p. 149.

Hymenaster echinulatus; HAECKEL (115) pl. xl. *H. regalis*, var *agassizi*, **n. var.**, 1242 fms., Martha's Vineyard; VERRILL (243) p. 221.

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Isaster bairdi, vide *Mediaster*.

Lasiaster, relations uncertain ; *L. hispidus* ; VERRILL (243) p. 198.

†*Lepidaster*, maintained, with genotype *L. grayi* ; GREGORY (111) p. 353.

†*Lepidasteridae*, diagnosed as fam. of *Cryptozonia* ; GREGORY (111) p. 352.

Linckia ehrenbergii, 6-rayed, comet-form, all specimens with 2 madreporites in adjoining interradii, from Zanzibar, colour in life ; LUDWIG (158) p. 542. *L. guildingii* ; CLARK (56) p. 130. *L. multiforis* ; BELL (32) p. 138. *L. multifora*, colour in life ; LUDWIG (158) p. 542.

†*Lindstromaster*, **n. g.** (p. 346) with genotype *Asterias antiqua* (Hisinger) ; GREGORY (111) p. 347, pl. xvi.

†*Lindstromasterinae*, **n. subfam.** of *Palaeasteridae* ; GREGORY (111) p. 346.

Litonotaster, **n. g.**, with genotype *Pentagonaster intermedius* Perr. ; VERRILL (243) p. 171, pl. xxviii.

Luidia ciliaris, breeding period, habitat, commensals ; LO BIANCO (147) p. 471. *L. clathrata*, Bermuda, colour ; CLARK (56) pp. 118, 130. *L. sarsi*, distribution, habitat, food ; ALLEN (8) p. 463 : breeding period, habitat ; LO BIANCO (147) p. 471 : vide etiam *Bipinnaria*.

Luidiidae, **n. fam.** = *Luidiinae* Slad. ; VERRILL (243) p. 201.

Marginaster austerus, **n. sp.**, W. Indies ; VERRILL (243) p. 221.

Mediaster, redefined (p. 178) ; *M. aequalis*, redescribed (p. 179, pl. xxiv) ; *M. agassizi*, n. sp., W. Indies (p. 181) ; *M. arcuatus* (p. 183) ; *M. bairdii* (p. 181, pls. xxiv, xxvi) ; *M. japonicus* (p. 183) ; *M. patagonicus* (p. 184) ; *M.* (*l*) *pedicellaris*, notes on a cotype (p. 182) ; *M. roseus* Alcock 1898, is probably *Pseudarchaster* (p. 184) : VERRILL (243).

Mediasterinae, **n. subfam.** of *Goniasteridae* ; VERRILL (243) p. 177.

†*Medusaster parvus*, **n. sp.**, Pilton beds, N.E. of Harford Landkey, N. Devon ; WHIDBORNE (250) p. 205, pl. xxxvii.

Mithrodia clavigera ; BELL (32) p. 138 : Zanzibar ; LUDWIG (158) p. 543.

†*Monaster*, restr. with genotype *M. giganteus* and made genus of *Palaeasterinae*, incl. also *M. stutchburyi* ; GREGORY (111) p. 345.

Nanaster, syn. of *Stephanasterias* (q.v.) ; VERRILL (243) p. 222.

Nardoa gomophia ?juv., Funafuti, 130 fms. ; HEDLEY (118 A) p. 530. *N. tuberculata* ; BELL (82) p. 138.

Nereidaster, **n. g.** vel s.-g., genotype *Nymphaster symbolicus* Slad., and incl. *N. bipunctus* Slad. ; VERRILL (243) p. 186.

Nymphaster, redefined (p. 184) ; *N. albidus* (p. 186) ; *N. arenatus* (p. 186) ; *N. basilicus* (p. 186) : VERRILL (243). *N. bipunctus*, see *Nereidaster*. *N. jacqueti* (Perr.) syn. of *N. prehensilis* (Perr.) (p. 186) ; *N. protentus* (p. 186) ; *N. subspinosus* (p. 185) : VERRILL (243). *N. symbolicus*, see *Nereidaster*. *N. ternalis* ; VERRILL (243) p. 185, pl. xxvi.

Odontaster, redefined (p. 205) ; *O. hispidus*, redescr. and restr. (p. 206, pl. xxix) ; *O. robustus*, **n. sp.**, 368 fms., Martha's Vineyard (p. 209, pl. xxix) ; *O. setosus*, **n. sp.**, 56–400 fms., Martha's Vineyard (p. 207, pl. xxix) : VERRILL (243).

Odontasteridae, **n. fam.** = *Gnathasterinae* Perr. – *Hoplaster* ; VERRILL (243) p. 201.

Ophidiaster pustulatus, incl. *O. purpureus* Perr., fr. Aldabra Id., measurements, few pedicellariæ ; LUDWIG (158) p. 541.

†*Palaeaster*, restr. with genotype *P. niagarensis* Hall ; *P. caractaci*, **n. sp.**, ex Salter MS., Caradoc Sandstone, ?Soudley Quarry, Church Stretton, Shropshire [Marshbrook, apud Salter] allied to *P. matutina* Hall : GREGORY (111) p. 344. *P. clarkei*, genotype of *Etheridgaster* (q.v.). *P. longimanus*, Pilton beds, N. Devon, now first descr. and figd. ; WHIDBORNE (250) p. 204, pls. xxvi & xxix.

†*Palaeasteridae* diagnosed, as fam. of *Phanerozonia* ; GREGORY (111) p. 344.

†*Palasterina*, spelling altered by GREGORY (111) to *Palaeasterina* (q.v.) : vide etiam sub *Sturtzaster*.

†*Palaeasterina*, rediagnosed, with genotype *P. primaeva* (Forbes) ; GREGORY

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(111) p. 349. *P. antiqua* (Hisinger), see *Lindstromaster*. *P. bonneyi*, **n. sp.**, Ludlow shales, Leintwardine, Shropshire; GREGORY (111) p. 349, pl. xvi and text-figg. *P. kinahani* Baily, see *Uranaster*. *P. stellata* Billings, see *Schuchertia*.

†*Palaeasterinae*, diagnosed as sub-fam. of *Palaeasteridae*; GREGORY (111) p. 344.

†*Palaeasterinidae*, diagnosed as fam. of *Phanerozonia*; GREGORY (111) p. 348.

†*Palaeasteroidea*, rejected; GREGORY (111) p. 342.

Palaeocoma Salter, vide *Sturtzaster*.

†*Palaeostella*, maintained, with genotype *P. solida*, and referred to *Aspidosomatidae*; GREGORY (111) p. 351.

Palmipes membranaceus, breeding period, habitat; LO BIANCO (147) p. 473. *P. placenta*, distribution, habitat; ALLEN (8) p. 464.

Paragonaster cylindratus; *P. elongatus*; *P. strictus*; *P. subtilis* compared with *P. formosus*: VERRILL (243) p. 196.

Pararchaster armatus, et *P. semisquamatus* var. *occidentalis*, vide *Benthopecten spinosus*.

Paxillosa, discussed and restr. to include *Porcellanasteridae*, *Archasteridae*, *Astropectinidae*, *Luidiidae*; VERRILL (243) p. 198.

Peltaster, **n. g.**, with genotype *P. hebes*, **n. sp.**, 294 fms. 'Albatross' station 2668, W. Indies (p. 168, pl. xxviii); *P. planus*, redescribed (p. 170, pl. xxviii): VERRILL (243).

Pentaceropsis obtusata; BELL (32) p. 136.

Pentaceros lincki and *P. nodosus*, Id. of Matupi, either varr. of one sp., or interbreed and produce hybrids; BELL (32) p. 136. *P. muricatus*; LUDWIG (158) p. 540.

Pentagonaster dates from Gray 1840, with genotype *P. pulchellus*, and incl. *P. abnormale*, *P. bourgeti*, *P. gunni*, and *P. lubeni*, while *Stephanaster* Ayres is syn.; VERRILL (243) pp. 147, 157, 158. *P. affinis*, vide *Pyrenaster*. *P. arcuatus*, vide *Mediaster*. *P. dentatus*, vide *Pyrenaster*. *P. granularis*, vide *Tosia*. *P. intermedius*, vide *Litonotaster*. *P. investigatoris*, vide *Eugoniaster*. *P. japonicus*, vide *Mediaster*. *P. lepidus*, vide *Hoplaster*. *P. patagonicus*, vide *Mediaster*. *P. planus*, vide *Peltaster*.

†*Petraster*, maintained, in *Palaeasterinae*, with genotype *P. rigidus*; GREGORY (111) p. 345.

Phanerozonia, extended to Palæozoic *Ast.*; GREGORY (111) p. 343: restr. by excl. *Asterinidae* and *Gymnasteridae* [what happens to these is not stated]; VERRILL (243) p. 200.

Plinthaster s.-g. of *Tosia* (q.v.); VERRILL (243) p. 161.

Plutonasteridae, **n. fam.** with sub-famm. *Mimasterinae*, *Plutonasterinae*, and *Pontasterinae*; VERRILL (243) pp. 200, 210.

Plutonaster agassizii, pedicellariæ (p. 211, pl. xxvii); *P. efflorescens*, description of holotype, which is "evidently the young of some large species" (p. 211): VERRILL (243). *P. subinermis*, breeding period, habitat; LO BIANCO (147) p. 473.

Pontaster forcipatus, evidence for bipolarity; THOMPSON (230) p. 319.

Porania pulvillus, distrib., habitat, habits; ALLEN (8) p. 463.

Prionaster, **n. g.**, with genotype *P. elegans*, **n. sp.**, 142 fms. 'Albatross' station 2401, G. of Mexico; VERRILL (243) p. 215, pl. xxvii.

†*Protaster* sp., Devonian, Belgium; DESTINEZ (71).

†*Protasteracanthion*, maintained as genus of *Taeniasteridae*, with genotype *P. primus*; GREGORY (111) p. 352.

Pseudarchaster, redefined (p. 189); *P. annectens* (p. 195); *P. aphrodite* (p. 195); *P. concinnus*, spines and genital pores discussed (p. 193, pl. xxx); *P. discus* (p. 195); *P. fallax*, incl. *Archaster parelii* pars (p. 190, pl. xxx); *P. granuliferus*, **n. sp.**, 'Albatross' station 2751

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(p. 192, pl. xxx); *P.* (?) *hispidus*, **n. sp.**, 600 fms., W. Indies, based on immature specimens (p. 191, pl. xxx); *P. hystrix* (p. 195); *P. intermedius*, incl. *Archaster parelii* pars, var. *insignis* Verrill 1895, "probably only the fully adult" (p. 190, pl. xxx); *P. mosaicus* (p. 196); *P. necator* (p. 195); *P. ordinatus*, **n. sp.**, 324–335 fms., 'Albatross' stations 2376 and 2396, G. of Mexico (p. 194, pl. xxx); *P. patagonicus* (p. 195); *P. roseus* (p. 196); *P. tessellatus* (p. 195): VERRILL (243).

Pseudarchasterinae emended as sub-fam. of *Pentagonasteridae*; VERRILL (243) p. 187.

Pseudoreaster, **n. g.**, with genotype *P. obtusangulus* (Lam.)=*Goniaster* Perrier non Agassiz; VERRILL (243) p. 148 footnote.

Pteraster (*Temnaster*) *hexactis*, vide *Hexaster obscurus*: Spitzbergen, protection of brood; DOEDERLEIN (78) p. 338. *P. militaris*; BIDENKAP (37) p. 99, and (38) p. 107. *P. pulvillus*; BIDENKAP (38) p. 108. *P. stellifer*; HAECKEL (115) pl. xl.

Pyrenaster, **n. g.**, with genotype *Pentagonaster dentatus* Perrier (p. 166); *P. affinis*, perhaps var. of *P. dentatus* (p. 168); *P. dentatus*, variations from the type (p. 167, pl. xxvii): VERRILL (243).

Pythonasterinae?, a young starfish possibly belonging to this sub-fam., from Lifu; BELL (32) p. 140, pl. xvii.

Retaster cribrosus; LUDWIG (158) p. 543.

Rosaster alexandri, discussed, very distinct from *Paragonaster*; VERRILL (243) p. 197.

†*Salteraster* Stürtz, said to be sym. of *Tetraster* Nich. and Eth.; ETHERIDGE (83): maintained as genus of *Taeniasteridae*, with genotype *Palaeaster asperrimus*; GREGORY (111) p. 352.

Scaphaster, **n. g.** (p. 27) with genotype *S. humberti*, **n. sp.**, Aripo, Ceylon, approaches *Asteropsis* of Fam. *Gymnasteridae*; LORIOL (154) p. 28 pl. iii.

†*Schoenaster* made a genus of *Palaeasterinidae*, with genotype *S. fimbriata*; GREGORY (111) p. 350.

†*Schuchertia*, **n. g.** of *Palaeasterinidae*, with genotype *Palaeasterina stellata*; GREGORY (111) p. 351.

Sideriaster, **n. g.** of *Astropectinidae*, with genotype *S. grandis*, **n. sp.**, 68 fms. 'Albatross' station 2378, G. of Mexico; VERRILL (243) p. 219, pl. xxx.

Solaster endeca; BIDENKAP (37) p. 99, and (38) p. 107. *S. papposus*, in Tromsö Sound, measurements; BIDENKAP (38) p. 107: breeding period; AURIVILLIUS (21) p. 12: distribution, habitat, habits, food; ALLEN (8) p. 464: variations in dorsal skeleton; DOEDERLEIN (78) p. 338. *S. syrtensis*, Spitzbergen, distinguished from *S. endeca*; DOEDERLEIN (78) p. 339.

†*Stenaster*, doubtfully maintained as genus of *Taeniasteridae*, with genotype *S. salteri*; GREGORY (111) p. 352. *S. pulchellus* Bill., see *Urasterella*.

Stephanaster, vide sub *Pentagonaster*.

Stephanasterias, name maintained, genotype *S. albula* incl. *Asterias gracilis* Perrier, distribution; VERRILL (243) p. 222.

Stichaster roseus, breeding period; AURIVILLIUS (21) p. 12.

†*Sturtzaster*, **nom. nov.** pro *Palaeocoma* Salter 1857, non D'Orbigny 1850; *S.*? *mitchelli*, **n. sp.**, Wenlock series at Bowning, N. S. W., possibly a *Palasterina*: ETHERIDGE (83).

†*Taeniaster*, maintained with genotype *T. spinosus* and excl. *T. cylindrus*; GREGORY (111) p. 351.

†*Taeniasteridae*, diagnosed as fam. of *Phanerozonia*,—but allied to *Cryptozonia*; l. c.

Temnaster hexactis, see *Hexaster obscurus*.

†*Tetraster* Nich. and Eth. anticipates *Salteraster* Stürtz; ETHERIDGE (83):

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doubtfully maintained, in *Palaeasterinae*, with genotype *T. wyville-thomsoni*; GREGORY (111) p. 345.

Tosia Gray 1840, has genotype *T. australis*, and must be preferred to *Pentagonaster* Perrier and Sladen, but is perhaps not distinct from *Pentagonaster* Gray, rediagnosed, with key to spp. which are arranged under sections—A. Typical, B. *Plinthaster*, C. *Ceramaster* (p. 158); *T.* (*Plinthaster*) *comta*, **n. sp.**, 683 fms. 'Albatross' station 2117, W. Indies (p. 163, pl. xxvii); *T. granularis*, specimen from Halifax N. S. described (p. 162); *T.* (*Plinthaster*) *nitida*, **n. sp.**, 335 fms. 'Albatross' station 2396, W. Indies (p. 165, pl. xxvii): VERRILL (243).

†*Trichasteropsis*, maintained, with genotype *T. cilicia*, and referred to *Aspidosomatidae*; GREGORY (111) p. 351.

†*Tropidaster* possibly "a later representative of the *Lepidasteridae*"; GREGORY (111) p. 353.

†*Urana ter*, **n. g.** of *Lindstromasterinae*, with genotype *Palaeasterina kinahani* which is rediagnosed; GREGORY (111) p. 347.

†*Urasterella*, maintained as genus of *Taeniasteridae*, with genotype *Uraster ruthveni*, and incl. *Stenaster pulchellus*; GREGORY (111) p. 352.

Valvata, discussed and extended to include *Linckiidae*, *Pentacerotidae*, *Antheneidae*, *Goniasteridae*, *Odontasteridae*, *Plutonasteridae*, *Goniopectinidae*, *Benthopectinidae*; VERRILL (243) p. 198.

†*Xenaster*, maintained provisionally, with genotype *X. margaritatus*, which, however, "if Simonowitsch's figures are incorrect" "might take rank close to *Palæaster eucharis*," while *X. simplex* "ought no doubt to be made the type of a new genus," but "the value of [the only diagnostic] character is doubtful" and "if Simonowitsch's figures are incorrect" it "might enter *Palæaster*"; GREGORY (111) p. 346.

†*Xenasterinae*, **n. subfam.** of *Palaeasteridae*; GREGORY (111) p. 346.

(E.)—OPHIUROIDEA.

List of new genera and species published since Lyman's Challenger Report, 1882; LÜTKEN & MORTENSEN (162) pp. 206–208.

Amphilepis patens Lym., "rather important differences," from type in specimens fr. 10° 14′ N., 96° 28′ W., 2232 fms.; LÜTKEN & MORTENSEN (162) p. 161, pl. x.

Amphilimna, **n. g.** with genotype *Ophiocnida olivacea* Lym., perhaps incl. *A. caribaea* Ljung. as young; VERRILL (244) p. 30.

Amphiocnida, **n. s-g.** of *Amphiura*; VERRILL (244) p. 26.

Amphiodia, **n. g.** with genotype *A. pulchella* (Lym.); VERRILL (244) p. 24.

Amphioplus, **n. g.** with genotype *A. tumida* (Lym.); VERRILL (244) p. 25.

Amphipholis, diagnosed, with genotype *A. squamata* or *A. elegans*; VERRILL (244) p. 24: "much better defined" than *Ophiocnida*, but apparently not accepted; LÜTKEN & MORTENSEN (162) p. 156. *A. goesi*, redescr. (p. 28); *A. tenera* maintained and a neanic specimen described (p. 29): VERRILL (244).

Amphipsila, **n. g.**, with genotype *A. fulva* (Lym. as *Ophiopsila*) (pp. 55, 57); *A. maculata*, **n. sp.**, 200 fms., off Havana (p. 55, pl. iii); VERRILL (244).

Amphiura, restricted and diagnosed, with genotype *A. chiajei* and subgenera *Ophiopelte*, *Hemilepis*, *Amphiocnida*; VERRILL (244) p. 24. *A. sp.*, disc wanting, therefore not named (p. 158, pl. xiii); *A. assimilis*, **n. sp.**, 2° 35′ N., 86° 55′ W., 770 fms., one specimen with irregular mouth-shields, perhaps related to *A. chilensis* (p. 153, pl. x); *A. brevipes*, **n. sp.**, 1° 7′ N., 81° 4′ W., 1740 fms. (p. 149, pl. xi); *A. canescens* Lym., referred to *Ophiactis* (p. 143): LÜTKEN & MORTENSEN (162). *A. caulleryi* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 42, pl. vi. *A. chiajei*, breeding period; LO BIANCO (147) p. 496. *A.*

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chilensis, colour in life, large individuals, and differences seen in neanic stage; LUDWIG (157) p. 12. *A. dalea*, specimens of this Atlantic sp. from E. Pacific, showing slight differences (p. 154, pl. xii); *A. diomedeae*, **n. sp.**, 7° 15′ N., 79° 36′ W., 1020 fms., and other stations of 'Albatross,' with some which are variations or young, sp. perhaps related to *A. chilensis* (p. 151, pl. xii): LÜTKEN & MORTENSEN (162). *A. dispar* as in (169) Zool. Rec. 1897, added locality "Pointe de Galles," 675 fms.; KOEHLER (142) p. 46, pl. x. *A. duplicata* Lym., referred to *Ophiactis* (q.v.); LÜTKEN & MORTENSEN (162) p. 142. *A. eugeniae*, comparative measurements and other differences between young and old, compared with *A. studeri*; LUDWIG (157) p. 8. *A. frigida* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 44, pls. xi, xii. *A. gastracantha*, **n. sp.**, 16° 33′ N., 99° 52′ W., 660 fms. "would belong to *Ophiocnida*" if that genus were accepted; LÜTKEN & MORTENSEN (162) p. 156, pl. xiii. *A. grandisquama*, redescr., some variations from type in Florida specimens; VERRILL (244) p. 26. *A. granulata*, **n. sp.**, 7° 12′ N., 80° 55′ W., 182 fms. "belongs to what is commonly called *Ophiocnida*," also "would be an *Amphipholis*" (p. 155, pl. x); *A. gymnogastra*, **n. sp.**, 7° 5′ N., 79° 40′ W., 1270 fms., very closely related to *A. semiermis*, and less so to *A. lanceolata* (p. 145, pl. ix); *A. gymnopora*, **n. sp.**, 7° 12′ N., 80° 55′ W., 182 fms. (p. 150, pl. xi): LÜTKEN & MORTENSEN (162). *A. magellanica*, not allied to *A. lymani* as Studer thought; LUDWIG (157) p. 10: post-larval growth-stages fully described and compared with those of *A. squamata*; LUDWIG (159) p. 227. *A. misera*, **n. sp.**, 265 fms., Andaman Is., allied to *A. squamata* and *tenuispina*; KOEHLER (142) p. 45, pl. viii. *A. notacantha*, **n. sp.**, 21° 15′ N., 106° 23′ W., 676 fms., "would belong to *Ophiocnida*" if that genus were accepted (p. 158, pl. xiii); *A. papillata*, **n. sp.**, 1° 3′ S., 89° 28′ W., 385 fms., perhaps an *Ophiochiton* (p. 159, pl. xiv): LÜTKEN & MORTENSEN (162). *A. partita* as in (169) Zool. Rec. 1897, added locality "Pointe de Galles," 675 fms.; KOEHLER (142) p. 48, pl. x: referred to *Ophiactis*; LÜTKEN & MORTENSEN (162) pp. 143, 207. *A. patagonica*, neanic individual; LUDWIG (157) p. 11: post-larval growth-stages fully descr. in this viviparous sp., and compared with those of *A. squamata*; LUDWIG (159) p. 230. *A. patula*, Lym., referred to *Ophiactis* (p. 143); *A. polycantha*, **n. sp.**, 7° 6′ N., 80° 43′ W., 695 fms. (p. 146, pl. ix); *A. seminuda*, **n. sp.**, 23° 16′ N., 107° 31′ W., 852 fms. (p. 148, pl. xi); *A. serpentina*, **n. sp.**, 7° 31′ N., 79° 14′ W., 458 fms., with varr. *a*, *b* and *c* from other stations of 'Albatross' (p. 143, pl. viii): LÜTKEN & MORTENSEN (162). *A. squamata*, 87 metres; CONDORELLI (61) p. 35: breeding period, habitat; Lo BIANCO (147) p. 469: of New Zealand; LUDWIG (157) pp. 19, 22: post-larval growth-stages compared with those of other *Oph.*; LUDWIG (159) p. 210. *A. stearnsi* Ives "evidently an *Ophionereis*"; LÜTKEN & MORTENSEN (162) p. 207. *A. virens*, breeding period, habitat; Lo BIANCO (147) p. 469.

Asteronyx, vide *Astronyx*.

Astrochelidae, **n. fam.**, for *Astrochele*, *Astrogomphus*, *Astroporpa*, *Astrotoma* and *Astrocnida*; VERRILL (244) p. 79.

Astrocnida isidis; VERRILL (244) p. 83.

Astrogomphus rudis, **n. sp.**, 200 fms., Pourtales Plateau, and 116 fms., Sandkey (p. 82, pl. vii); *A. vallatus*, redescr., large regenerated specimen, and various young stages (p. 80): VERRILL (244).

Astronycidae, **n. fam.**, for *Astronyx* and *Astrodia*: VERRILL (244) p. 74.

Astronyx or *Asteronyx*, key to spp. (p. 187); *A. dispar*, **n. sp.**, 7° 9′ N., 80° 50′ W., 322 fms., closely resembles *A. loveni* (p. 185, pls. xxi & xxii); *A. excavata*, **n. sp.**, 21° 15′ N., 106° 23′ W., 676 fms. and 21° 21′ N., 106° 25′ W., 146 fms., with young specimen (p. 185,

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pl. xxii): Lütken & Mortensen (162). *A. loveni* as in (169) Zool. Rec. 1897, but the locality, previously given as Laccadives, 406 fms., is now omitted [? by mistake]; Koehler (142) p. 74. *A. lymani*, **n. sp.**, 200 fms., off Havana, resembles *A. loveni* and *A. locardi*; Verrill (244) p. 74, pl. viii. *A. plana*, **n. sp.**, 6° 17′ N., 82° 5′ W., 1672 fms., and other stations of 'Albatross'; Lütken & Mortensen (162) p. 186, pls. xxi & xxii.

Astrophyton caecilia (p. 85); *A. muricatum*, variations and young (p. 84): Verrill (244).

Astroporpa annulata, distribution and habitat; Verrill (244) p. 82.

Astroschema arenosum; Verrill (244) p. 77. *A. brachiatum* and *A. horridum*; Haeckel (115) pl. x. *A. intectum* (p. 77); *A. nuttingi*, **n. sp.**, 105 fms., off Sandkey, 125 fms., off Key West (p. 77, pl. vii); *A. oligactes*, distribution, habitat, a 6-rayed specimen (p. 76): Verrill (244). *A. rubrum*; Haeckel (115) pl. x. *A. sublaeve*, **n. sp.**, 7° 6′ N., 80° 34′ W., 695 fms., and other stations of 'Albatross,' closely related to *A. clavigera*; Lütken & Mortensen (162) p. 187, pl. xxii.

Astroschem[at]idae, **n. fam.**, for *Astroschema*, *Astrocreas* and *Ophiocreas*; Verrill (244) p. 76.

Drepanaster, **n. g.**, pro *Protaster scabrosus* (q.v.) et *P. forbesi*; Whidborne (250) p. 208.

†*Ephippiellidae*, **n. fam.** (of *Foraminifera*) pro *Ephipipiellum*; Łomnicki (152 B) p. 227.

†*Ephipipiellium symmetricum*, **n. g. et sp.**, Miocene of Wieliczka, Galicia supposed Foraminifer; Łominicki (152 B) p. 224, pl.-f. 3: but shown to be only arm-vertebrae of *Oph.*; Szajnoche (226).

†*Eucladia*:—*E. johnsoni*, orientation and arm-structures (p. 692); *E. woodwardi*, **n. sp.**, Lower Ludlow sandstone, Leintwardine, Shropshire (p. 695), with reconstructed figg. 1 & 2: Sollas (216).

†*Eugaster ?perarmatus* Whidb., Pilton beds of Braunton Down, in Mus. Pract. Geol., and of Pilton, in Porter coll., now first descr. and figd.; Whidborne (250) p. 209, pl. xxvii.

†*Euthemon*, **n. g.**, of *Eucladidae*, with genotype *E. igerna*, **n. sp.**, Wenlock Limestone, Malvern district, England: Sollas (216) p. 696, fig. 3, and reconstruction fig. 4.

Gorgonocephalidae, restr.; Verrill (244) p. 83.

Gorgonocephalus chilensis; Ludwig (157) p. 16. *G. cornutus* as in (169) Zool. Rec. 1897; Koehler (142) p. 73, pls. xii, xiii. *G. diomedeae*, **n. sp.**, 7° 6′ N., 80° 34′ W., 695 fms., an abnormal specimen; Lütken & Mortensen (162) p. 188, pls. xxi, xxii. *G. lamarcki*; Bidenkap (38) p. 111. *G. levigatus* as in (169) Zool. Rec. 1897, but a well-preserved specimen from Trincomalee is added, and comparative measurements given; Koehler (142) p. 71, pls. xii, xiv. *G. mucronatus*, colour, variations in spines; Verrill (244) p. 85. *G. robillardi*, **n. sp.**, Mauritius, on a gorgonian, resembles "*Astrophyton costosum A. costis conicis in basi reclinata laceris*" of Linck., p. 64; Loriol (154) p. 31, pl. iii.

Gymnophiura, **n. g.**, closely related to *Ophioglypha*, esp. *O. inermis*, with genotype *G. mollis* (p. 111); *G. coerulescens*, **n. sp.**, 23° 59′ N., 108° 40′ W., 995 fms., perhaps should be *Ophioglypha* (p. 114, pl. vii); *G. mollis*, **n. sp.**, 7° 5′ N., 79° 40′ W., 1270 fms., and other stations of 'Albatross' (p. 111, pl. vii): Lütken & Mortensen (162).

Hemieuryalidae, **n. fam.**, for *Hemieuryale*, *Ophioplus*, and *Sigsbeia*; Verrill (244) p. 70.

Hemilepis, subgenus [**? n. s-g.**] of *Amphiura*; Verrill (244) p. 26.

Hemipholis cordifera and *H. wallichi*, cf. post-larval growth-stage of *Ophiactis asperula*: Ludwig (159) p. 222.

Ophiacantha, systematic importance of spines; Lütken & Mortensen

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(162) p. 165: restricted; VERRILL (244) pp. 36, 41. *O. aspera*, variations from the type in Havana specimens; VERRILL (244) p. 44. *O. bairdi*, a specimen of this Atlantic sp., from 23° 59′ N., 108° 40′ W., 995 fms., additions to Lyman's account; LÜTKEN & MORTENSEN (162) p. 177, pl. xviii. *O. bidentata*; BIDENKAP (37) p. 100, and (38) p. 111. *O. composita* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 59, pls. viii, ix. *O. contigua*, **n. sp.**, 4° 3′ N., 81° 31′ W., 899 fms. (p. 173, pls. xvi, xvii); *O. cosmica*, specimens from E. Pacific, showing slight variations fr. Lyman's type (p. 166, pl. xv); *O. costata*, **n. sp.**, 7° 6′ N., 80° 34′ W., 695 fms., and other stations of 'Albatross,' rather nearly related to *O. discoidea* (p. 172, pls. xvi, xvii): LÜTKEN & MORTENSEN (162). *O. duplex* as in (169) Zool. Rec. 1897 (p. 60, pls. viii & ix); *O. gratiosa*, ditto (p. 56, pls. viii & ix): KOEHLER (142). *O. hirta*, **n. sp.**, 21° 19′ N., 106° 24′ W., 680 fms., and 23° 16′ N., 107° 31′ W., 852 fms.; LÜTKEN & MORTENSEN (162) p. 174, pl. xviii. *O. hirsuta*, vide sub *O. sertata*, *Ophiopristis*. *O. inconspicua*, **n. sp.**, 6° 35′ N., 81° 44′ W., 782 fms., and other stations of 'Albatross,' also young of this or of *O. pentacrinus*; LÜTKEN & MORTENSEN (162) p. 168, pl. xv. *O. lineolata*, vide sub *Ophiopristis*. *O. moniliformis*, **n. sp.**, 16° 32′ N., 99° 48′ W., 493 fms., and other stations of 'Albatross' (p. 171, pl. xvi); *O. normani*, specimens fr. E. Pacific, showing slight differences fr. Lyman's type (p. 170, pl. xvi): LÜTKEN & MORTENSEN (162). *O.* (*Ophialcaea*) *nuttingi*, **n. sp.**, 200 fms. off Havana; VERRILL (244) pp. 43, 46, pls. i, viii. *O. pacifica*, **n. sp.**, 1° 7′ N., 80° 21′ W., 1573 fms. (p. 166, pls. xv, xvi); *O. paucispina*, **n. sp.**, 6° 10′ N., 83° 6′ W., 1471 fms., and other stations of 'Albatross,' nearly related to *O. bartletti* (p. 175, pl. xviii): LÜTKEN & MORTENSEN (162). *O. pentagona* as in (169) Zool. Rec. 1897, added locality, C. Bluff; KOEHLER (142) p. 53, pl. iv. *O. rosea*, evidence for bipolarity; THOMPSON (230) p. 321. *O. sertata*, vide sub *Ophiopristis*. *O. sociabilis* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 58, pls. x, xi. *O. spinifera*, **n. sp.**, 7° 9′ N., 81° 8′ W., 546 fms., and 7° 15′ N., 79° 36′ W., 1020 fms.; LÜTKEN & MORTENSEN (162) p. 169, pls. xvi, xvii. *O. stellata*; VERRILL (244) p. 45. *O. vestita* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 54, pl. iii. *O. vivipara*, 3 post-larval growth-stages descr. in detail; LUDWIG (159) p. 232: measurements, granules of disc, spicules in bursæ walls, arm-spines hollow, and other features compared with var. *kerguelensis*, the validity of which is doubted; LUDWIG (157) p. 13. *O. vorax* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 62, pl. vii.

Ophiacanthella, **n. g.**, with genotype *O. troscheli* (Lym.); VERRILL (244) pp. 39, 43.

Ophiacanthidae, **n. fam.** = *Ophiacanthinae* of Ljungman and Lütken, with analytical table of genera and species; VERRILL (244) p. 34.

Ophiactis asperula, colour, size, arm-spines, variation in dorsal spines, young on disc; LUDWIG (157) p. 6: post-larval growth-stages compared with those of other *Oph.* and fully described with text-figg.; LUDWIG (159) p. 212. *O. balli*, distribution, habitat, habits; ALLEN (8) p. 470. *O. dispar*, **n. sp.**, Bahama Banks, perhaps a var. or adult of *O. krebsi*; VERRILL (244) p. 31, pl. viii. *O. duplicata* (Lym.), an Atlantic sp. now found in E. Pacific with slight differences; LÜTKEN & MORTENSEN (162) p. 142, pl. vi. *O. krebsi*, maintained, but perhaps the ordinary specimens are young; VERRILL (244) p. 34. *O. kröyeri*, post-larval growth-stages, fully described and compared with those of other *Oph.*, with text-figg.; LUDWIG (159) p. 223. *O. lorioli* as in (169) Zool. Rec. 1897; KOEHLER (142), p. 41, pl. vi: referred to *Amphiura*; LÜTKEN & MORTENSEN (162) pp. 143, 207. *O. muelleri*; CLARK (56) p. 130: var. *quinqueradia* discussed; VERRILL (244)

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p. 32. *O. perplexa* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 40, pl. vi. *O. profundi*, **n. sp.**, 4° 3′ N., 81° 31′ W., 899 fms., and 0° 16′ S., 90° 21′ W., 551 fms., closely related to *O. flexuosa* and *O. plana*; LÜTKEN & MORTENSEN (162) p. 140, pl. vi. *O. savignyi*; l. c. p. 140: incl. *O. sexradia* Grube and *O. incisa* v. Martens, 7 are 6-rayed, the eighth is regenerating, Zanzibar; LUDWIG (158) p. 545. *O. virens*, measurements; CONDORELLI (61) p. 35.

Ophialcaea, **n. s-g.** of *Ophiacantha*, with genotypes *O. nuttingi* n. sp. and *O. tuberculosa* Lym.; VERRILL (244) pp. 38, 42.

Ophiarthrum elegans, colour in life, plates in dorsal disc-covering, marginals; LUDWIG (158) p. 547.

Ophiectodia, **n. s-g.** of *Ophiacantha*, incl. *O. enopla* Verr., *O. rosea* Lym., and *O. spectabilis* Sars; VERRILL (244) p. 42.

Ophientodia, **n. s-g.**, of *Ophiacantha*, incl. *O. scutata* Lym., *O. cuspidata* Verr., and *O. pectinula* Verr.; VERRILL (244) p. 41.

Ophiernus adspersus as in (169) Zool. Rec. 1897; KOEHLER (142) p. 32. *O. annectens*, **n. sp.**, 0° 57′ S., 89° 3′ W., 421 fms., closely allied to *O. adspersus* fr. Atlantic (p. 107, pl. v); *O. polyporus*, **n. sp.**, 7° 9′ N., 81° 8′ W., 546 fms. (p. 109, pl. v); *O. seminudus*, **n. sp.**, 6° 17′ N., 82° 5′ W., 1672 fms., and other stations of 'Albatross,' closely related to *O. vallincola* fr. Atlantic (p. 105, pl. v): LÜTKEN & MORTENSEN (162). *O. vallincola*, evidence for bipolarity; THOMPSON (230) p. 321.

Ophiocamax austera, **n. sp.**, 110 fms., off Havana, allied to *O. fasciculata* and *O. hystrix*; VERRILL (244) p. 60, pls. vi, vii. *O. fasciculata* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 67.

Ophiocoramis clausa, cf. post-larval growth-stage of *Ophiactis asperula*; LUDWIG (159) p. 222. *O. tenera* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 33, pl. v.

Ophiochiton ambulator as in (169) Zool. Rec. 1897, added localities "Delta du Godavery," "Côte de Malabar," added comparison with *O. lymani* and *O. grandis*; KOEHLER (142) p. 49, pl. vi. *O. carinatus*, **n. sp.**, 7° 9′ N., 80° 50′ W., 322 fms., and other stations of 'Albatross'; LÜTKEN & MORTENSEN (162), p. 164, pl. xiv. *O. modestus* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 51, pls. ix, x: possibly an *Amphiura*; LÜTKEN & MORTENSEN (162) p. 160.

Ophiochondrus gracilis, **n. sp.**, 110–260 fms., off Havana; VERRILL (244) p. 64, no figure.

†*Ophiocistia*, **ord. nov.** incl. *Eucladidae*; SOLLAS (216) p. 692.

Ophiocnida, genus not accepted; LÜTKEN & MORTENSEN (162) p. 156. *O. brachiata*, rediscovered at Salcombe, Devon; NORMAN (183) p. 289.

Ophocoma brevipes, incl. *O. insularia* Lym. and *O. ternispina* v. Martens, fr. Zanzibar and Aldabra Id.; LUDWIG (158) p. 546. *O. doederleini*, **n. sp.**, Mauritius, compared with *O. scolopendrina*; LORIOL (154) p. 30, pl. iii. *O. echinata*; CLARK (56) p. 131; VERRILL (244) p. 22. *O. erinaceus*; BELL (32) p. 139. *O. nigra*, distribution, habitat, habits, food; ALLEN (8) p. 470. *O. pica*; BELL (32) p. 139. *O. pumila*; CLARK (56) p. 131; VERRILL (244) p. 23. *O. riisei*; VERRILL (244) p. 22. *O. rosula*; HAECKEL (115) pl. x. *O. scolopendrina*, perhaps identical with *O. erinaceus*; BELL (32) p. 139: incl. *O. erinaceus* M. & Tr., *O. schoenleinii* M. & Tr., *O. alternans* v. Martens, from Zanzibar and Aldabra Id.; LUDWIG (158) p. 545. *O. valenciae*; LUDWIG (158) p. 547.

Ophioconis indica as in (169) Zool. Rec. 1897; KOEHLER (142) p. 39, pl. ii. *O. miliaria*, slight variation from type; VERRILL (244) p. 17.

Ophiocreas sp. as in (169) Zool. Rec. 1897; KOEHLER (142) p. 70. *O. lumbricus*; VERRILL (244) p. 78. *O. oedipus*; HAECKEL (115) pl. x. *O. spinulosus*; VERRILL (244) p. 79.

Ophiocten amitinum, measurements, colour, not viviparous; LUDWIG

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(157) p. 4. *O. hastatum*, evidence for bipolarity; THOMPSON (230) p. 321. *O. pacificum*, **n. sp.**, 5° 43′ N., 85° 50′ W., 978 fms., and many other stations of 'Albatross'; LÜTKEN & MORTENSEN (162) p. 131, pl. iii. *O. sericeum*, evidence for bipolarity; THOMPSON (230) p. 320.

Ophiodera, **n. g.**, with genotype *O. serpentaria* (Lym.); VERRILL (244) pp. 65, 67. *O. stimpsoni* Verrill [but perhaps intended as **n. sp.**], ? incl. *Ophioscolex stimpsoni* Lyman, described; VERRILL (244) p. 67, pl. ii.

Ophioderma brevispina and *O. holmesi*, perhaps identical with *O. variegata*; LÜTKEN & MORTENSEN (162) p. 101. *O. longicauda*; CONDORELLI (61) p. 34. *O. panamensis* (p. 100); *O. variegata*, specimen fr. Panama, slightly different from type (p. 100, pl. i): LÜTKEN & MORTENSEN (162).

Ophioglypha, subdivisions discussed (p. 129); *O. abcisa*, **n. sp.**, 5° 36′ N., 86° 56′ W., 134 fms. (p. 117, pl. v): LÜTKEN & MORTENSEN (162). *O. acervata*; VERRILL (244) p. 12. *O. aequalis* as in (169) Zool. Rec. 1897, added locality Andaman Is.; KOEHLER (142) p. 16, pl. v. *O. bullata*, evidence for bipolarity; THOMPSON (230) p. 321. *O. convexa*, dorsal plates; LUDWIG (159) p. 218. *O. divisa*, **n. sp.**, 0° 54′ N., 91° 9′ W., 1189 fms., and 2° 34′ N., 92° 6′ W., 1360 fms., very near to *O. inornata*, also a young specimen; LÜTKEN & MORTENSEN (162) p. 127, pls. iv, v. *O flagellata* as in (169) Zool. Rec. 1897, added locality Colombo; KOEHLER (142) p. 18. *O. forbesi*, not intermediate between *Ophioglypha* and *Ophiomusium*, as Koehler says; LÜTKEN & MORTENSEN (162) p. 130. *O. imbecillis* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 21. *O. inermis*, should perhaps be included in *Gymnophiura*; LÜTKEN & MORTENSEN (162) p. 115. *O. inflata* (p. 10, pl. xi), *O. involuta* (p. 15, pl. viii): both as in (169) Zool. Rec. 1897; KOEHLER (142). *O. irrorata*, evidence for bipolarity; THOMPSON (230) p. 320. *O. lacertosa*, breeding period, habitat; LO BIANCO (147) p. 471. *O. lymani*, measurements and notes; LUDWIG (157) p. 5. *O. minuta*, cf. post-larval growth-stage of *Ophiactis asperula*; LUDWIG (159) p. 223. *O. nana*, **n. sp.**, 5° 30′ N., 86° 8′ W., 902 fms. (p. 126, pl. ii); *O. obtecta*, **n. sp.**, 0° 36′ S., 86° 46′ W., 1322 fms., and other stations of 'Albatross' (p. 119, pl. ii): LÜTKEN & MORTENSEN (162). *O. orbiculata* as in (169) Zool. Rec. 1897, but Laccadive Is. omitted from localities (p. 21); *O. palliata* as in (169) Zool. Rec. 1897 (p. 18); *O. paupera*, idem (p. 11, pl. iv): KOEHLER (142). *O. plana*, **n. sp.**, 6° 35′ N., 81° 44′ W., 782 fms., and many other stations of 'Albatross,' neanic specimens also descr., sp. allied to *O. tumulosa*; LÜTKEN & MORTENSEN (162) p. 122, pl. iii. *O. radiata* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 19. *O. robusta*; BIDENKAP (37) p. 100: colour; BIDENKAP (38) p. 110. *O. sculptilis* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 21. *O. scutata*, cf. post-larval growth-stage of *Ophiactis asperula*; LUDWIG (159) p. 222. *O. scutellata*, **n. sp.**, 21° 19′ N., 106° 24′ W., 680 fms.; LÜTKEN & MORTENSEN (162) p. 125, pl. ii. *O. solida*, post-larval growth-stages; LUDWIG (159) pp. 219, 220. *O. sordida* as in (169) Zool. Rec. 1897, but more detailed comparison with *O. paupera*; KOEHLER (142) p. 13, pl. v. *O. superba*, **n. sp.**, 23° 59′ N., 108° 40′ W., 995 fms., and 16° 34′ N., 100° 3′ W., 772 fms. (p. 116, pl. vii); *O. tumulosa*, **n. sp.**, 6° 17′ N., 82° 5′ W., 1672 fms., and many other stations of 'Albatross,' neanic specimens also descr. and figd, sp. recalls *O. grandis* (p. 120, pl. i): LÜTKEN & MORTENSEN (162). *O. undulata* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 19.

Ophioglyphina Ludw. s. g. of *Ophioglypha*, includes spp. which are not closely related; LÜTKEN & MORTENSEN (162) p. 129.

Ophiolepis annulosa; BELL (32) p. 139; LUDWIG (158) p. 544.

Ophiolimna, **n. g.**, with genotype *O. bairdi* (Lym.); VERRILL (244) pp. 40, 44.

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Ophiolypus granulatus as in (169) Zool. Rec. 1897; KOEHLER (142) p. 31, pl. vii.

Ophiomastix annulosa and *O. mixta*; BELL (32) p. 139. *O. venosa*, plates in dorsal disc-covering; LUDWIG (158) p. 548.

Ophiomastus secundus, dorsal plates (p. 217); *O. tegulitius*, post-larval growth-stages (p. 219): LUDWIG (159). *O. tumidus*, idem, *l. c.*: as in (169) Zool. Rec. 1897; KOEHLER (142) p. 8, pl. i.

Ophiomitra, redefined; VERRILL (244) p. 57: "a very ill defined genus, which can scarcely be upheld"; LÜTKEN & MORTENSEN (162) p. 171. *O. granifera*, **n. sp.**, 21° 15′ N., 106° 23′ W., 676 fms., and 21° 21′ N., 106° 25′ W., 146 fms.; LÜTKEN & MORTENSEN (162) p. 177, pl. xix. *O. integra* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 64, pls. v and vii. *O. normanni*, replaced in *Ophiacantha*; LÜTKEN & MORTENSEN (162) p. 171. *O. ornata*, **n. sp.**, 110 and 200 fms., off Havana: VERRILL (244) p. 58, pl. v. *O. partita*, **n. sp.**, 21° 15′ N., 106° 23′ W., 676 fms.; LÜTKEN & MORTENSEN (162) p. 179, pl. xix. *O. rudis* as in (169) Zool. Rec. 1897, added localities Laccadive Is., 705 fms., Maldive Is., 719 fms.; KOEHLER (142) p. 65, pl. vii. *O. valida*; VERRILL (244) p. 58.

Ophiomitrella, **n. g.**, with genotype *O. laevipellis* (Lym.); VERRILL (244) pp. 39, 43.

Ophiomusium subdivided into A. spp. with ventral plates in most of the length of the arm, *a*, genital slits do not reach margin of disc, *b*, large genital slits reach margin of disc, B. spp. with ventral plates only on 3–5 proximal segments of arm; LÜTKEN & MORTENSEN (162) p. 139. *O. diomedeae*, **n. sp.**, 1° 3′ S., 89° 28′ W., 385 fms., also a younger stage, sp., resembles *O. familiare*; LÜTKEN & MORTENSEN (162) p. 134, pl. iv. *O. eburneum*, var. *elegans* Verrill [*? var. nov.*], 110–260 fms. off Havana; VERRILL (244) p. 12, pl. iii. *O. elegans* as in (169) Zool. Rec. 1897, but Malabar is substituted for Laccadives as a locality (p. 23, pl. iii); *O. familiare* as in (169) Zool. Rec. 1897, but localities given are coast of Malabar and Maldive Is., not Laccadives (p. 22, pl. iv): KOEHLER (142). †*O. ferrugineum* (p. 222) and *O. flabellum* (p. 223), cf. postlarval growth-stage of *Ophiactis asperula*; LUDWIG (159). *O. glabrum*, **n. sp.**, 5° 56′ N., 85° 10′ W., 1175 fms., and many other stations of 'Albatross,' with younger specimens; LÜTKEN & MORTENSEN (162) p. 132, pl. iv. *O. lunare*, cf. post-larval growth-stage of *Ophiactis asperula* (p. 222); *O. lymani*, post-larval growth-stages (p. 220): LUDWIG (159): redescr. and figd., also very young specimens; LÜTKEN & MORTENSEN (162) p. 137, pl. iii. *O. planum* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 26. *O. pulchellum*, post-larval growth-stages, LUDWIG (159) p. 220. *O. scalare* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 26, pls. ii, iii. *O. sculptum*, **n. sp.**, 110–260 fms. off Havana, allied to *O. acuferum*; VERRILL (244) p. 16, pls. ii, viii. *O. simplex*; BELL (32) p. 139. *O. stellatum*, **n. sp.**, 110–260 fms. off Havana, resembles the Japanese *O. cancellatum* (p. 14, pl. i); *O. testudo* (p. 14): VERRILL (244). *O. validum* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 25. *O. variabile*, **n. sp.**, 16° 32′ N., 99° 48′ W., 493 fms., and a variation from 21° 21′ N., 106° 25′ W., 146 fms., sp. resembles *O. elegans*; LÜTKEN & MORTENSEN (162) p. 135, pl. iv.

Ophiomyxa bengalensis as in (169) Zool. Rec. 1897; KOEHLER (142) p. 69, pl. xii. *O. brevicauda*, **n. sp.**, 110 and 200 fms., off Havana; VERRILL (244) p. 66, pl. iii. *O. flaccida*; CLARK (56) p. 131: colour; VERRILL (244) p. 65. *O. panamensis*, **n. sp.**, 7° 33′ N., 78° 34′ W., 85 fms., and Panama; LÜTKEN & MORTENSEN (162) p. 182, pl. vii. *O. pentagona*, 87 metres; CONDORELLI (61) p. 35: breeding period; LO BIANCO (147) p. 472. *O. tumida*; VERRILL (244) p. 67, pl. iii.

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O. vivipara, measurements; LUDWIG (157) p. 15; post-larval growth-stages sought for, but only one found; LUDWIG (159) p. 235.
Ophiomyxidae, redefined; VERRILL (244) p. 65.
Ophionereis annulata, from Panama (p. 162, pl. xiii); *O. nuda*, **n. sp.**, 7° 33′ N., 78° 34′ W., 85 fms., and 0° 57′ S., 89° 38′ W., 53 fms. "apparently nearly related to *Ophiotriton semoni*" (p. 163, pl. xiv): LÜTKEN & MORTENSEN (162). *O. reticulata*; VERRILL (244) p. 30: habitat, CLARK (56) pp. 118, 131.
Ophiopaepale goesiana, colour; VERRILL (244) p. 8.
Ophiopelte, subgenus [? **n. s-g.**] of *Amphiura*; VERRILL (244) p. 25.
Ophiopeza custos as in (169) Zool. Rec. 1897; KOEHLER (142) p. 35, pl. iii. *O. petersi*; VERRILL (244) p. 8.
Ophiopholis aculeata; BIDENKAP (37) p. 100.
Ophiophthirius actinometrae dorsal plates (p. 218), hooked spines not a generic character (p. 216); LUDWIG (159).
Ophioplax ljungmani; VERRILL (244) p. 31.
Ophioplocus huttoni, **n. sp.**, among sea-weed at Lyall B., near Wellington, N. Z.; FARQUHAR (84). *O. imbricatus*, Zanzibar, measurements; LUDWIG (158) p. 544.
Ophioplus, **n. g.** (p. 70) with genotype *Hemieuryale tuberculosa* Lym. redescr. (p. 71, pl. i); VERRILL (244).
Ophiopristis, **n. g.**, with genotype *O. hirsuta* (Lym.) (pp. 39, 40, 44); *O. ensifera*, **n. sp.**, 110–260 fms. off Havana (p. 47, pl. iv); *O. hirsuta*, variations from the type in Havana specimens (p. 49); *O.* (*Ophiotreta*) *lineolata*, variations from the type and from Lyman's figures, in Havana specimens (p. 51); *O.* (*Ophiotreta*) *sertata*, variations from original description (p. 54): VERRILL (244).
Ophiopora, **n. g.**, with genotype *O. bartletti* (Lym.); VERRILL (244) pp. 39, 43.
Ophiopsila annulosa, breeding period, phosphorescent; *O. aranea*, breeding period, habitat: Lo BIANCO (147) p. 472. *O. riisei*; VERRILL (244) p. 23.
Ophiopyren bispinosus as in (169) Zool. Rec. 1897; KOEHLER (142).
Ophiopyrgus alcocki as in (169) Zool. Rec. 1897; KOEHLER (142) p. 6, pl. i: post-larval growth-stages; LUDWIG (159) p. 219. *O. saccharatus*, dorsal plates; LUDWIG (159) p. 218: perhaps intermediate between *Ophiopyrgus* and *Ophioglypha*; KOEHLER (142) p. 8. *O. wyville-thomsoni*, post-larval growth-stages; LUDWIG (159) p. 219.
Ophioscalus, **n. g.** [or ? **n. s-g.** of *Ophiacantha*] with genotype *O. echinulatus* (Lym.); VERRILL (244) pp. 39, 42.
Ophiostigma isacantha; CLARK (56) p. 131.
Ophiothamnus, diagnosed; VERRILL (244) p. 40: "as ill defined as *Ophiomitra*"; LÜTKEN & MORTENSEN (162) p. 181. *O. laevis*, **n. sp.**, 0° 16′ S., 90° 21′ W., 551 fms., "some resemblance to *O. remotus*"; op. cit. p. 180, pl. xix.
Ophiotholia supplicans; HAECKEL, p. 115, pl. x.
Ophiothrichidae diagnosed; VERRILL (244) p. 18.
Ophiothrix alopecurus, breeding period, habitat; Lo BIANCO (147) p. 472.
O. angulata, variations, colour, and brephic examples; VERRILL (244) p. 18. *O. aristulata*, var. *investigatoris* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 67, pl. xi. *O. capillaris*; HAECKEL (115) pl. x. *O. echinata*; CONDORELLI (61) p. 35: breeding period, habitat, commensal; Lo BIANCO (147) p. 472. *O. fragilis*; CONDORELLI (61) p. 35: distribution, habitat, habits, food; ALLEN (8) p. 471: breeding period, habitat; Lo BIANCO (147) p. 472: breeding period; AURIVILLIUS (21) p. 13. *O. galapagensis*, **n. sp.**, 0° 57′ S., 89° 38′ W., 53 fms., 4 specimens, of which one has 6 arms; LÜTKEN & MORTENSEN (162) p. 181, pl. xx. *O. hirsuta*; LUDWIG (158) p. 549. *O. oerstedi*, colour; VERRILL

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(244) p. 20. *O. otiosa*, Zanzibar, under stones; LUDWIG (158) p. 549. *O. spiculata*, Panama; LÜTKEN & MORTENSEN (162) p. 181. *O. suensonii*, colour; VERRILL (244) p. 21.

Ophiothyreus goesi; VERRILL (244) p. 12.

Ophiotreta, **n. s-g.** of *Ophiopristis*, with genotype *O. lineolata* Lym.; VERRILL (244) pp. 40, 44.

Ophiotriton, genus not accepted; LÜTKEN & MORTENSEN (162) p. 163.

Ophiotrochus panniculus as in (169) Zool. Rec. 1897, but the depth of 1200 fms. is now quoted as from Minicoy; KOEHLER (142) p. 29.

Ophiotypa simplex discussed; LUDWIG (159) p. 213: as in (169) Zool. Rec. 1897, but added comparison with young stages of other *Oph.*; KOEHLER (142) p. 3, pl. i.

Ophiozona alba, **n. sp.**, 5° 56′ N., 85° 10′ W., 1175 fms., and other stations of 'Albatross,' allied to *O. depressa*, slight variations; LÜTKEN & MORTENSEN (162) p. 102, pl. vi. *O. bispinosa* as in (169) Zool. Rec. 1897; KOEHLER (142) p. 34, pl. ii. *O. contigua*, **n. sp.**, 0° 36′ S., 86° 46′ W., 1322 fms., and 2° 34′ N., 92° 6′ W., 1360 fms.; LÜTKEN & MORTENSEN (162) p. 101, pl. vi. *O. impressa* (p. 8); *O. nivea*, redescr. with var. *compta* Verrill [? **var. nov.**] 110–263 fms. off Havana, 200 fms. Barbados, variation in oral shields (p. 9, pl. iii): VERRILL (244).

Ophiura:—†*O.* ?; DIBLEY (75). *O. affinis*, distribution, habitat, habits; ALLEN (8) p. 470. *O. albida*; BIDENKAP (37) p. 100: in Tromsö Sound, colour, measurements, distinction from *O. carnea*; BIDENKAP (38) p. 110: distribution, habitat, habits; ALLEN (8) p. 468. *O. appressa*; CLARK (56) p. 130; VERRILL (244) p. 6. *O. brevicauda* (p. 5); *O. brevispina* with var. *olivacea*, and unnamed varieties (p. 4): VERRILL (244). *O. ciliaris*, distribution, habitat, habits, food; ALLEN (8) p. 468. *O. cinerea*; VERRILL (244) p. 6. *O. olivacea*, embryology; GRAVE (110). *O. pallida*, **n. sp.**, 110 and 200 fms. off Havana (p. 7, pl. ii); *O. rubicunda*, colour in life and alcohol (p. 6): VERRILL (244). *O. sarsii*; BIDENKAP (37) p. 100: young very like *O. albida*; BIDENKAP (38) p. 110. *O. texturata*, breeding period; AURIVILLIUS (21) p. 13.

†*Ophiurella* ? *gregaria*, Whidb., Pilton beds of Braunton Down, in Mus. Pract. Geol., now first descr. and figd., compared with *Protaster leptosoma*, *Furcaster palaeozoicus*, and *Ophiura rhenana*; WHIDBORNE (250) p. 210, pl. xxviii.

Pectinura angulata; VERRILL (244) p. 8. *P. conspicua* (p. 37, pl. ii) and *P. heros* (p. 38), as in (169) Zool. Rec. 1897; KOEHLER (142).

Pectinuridae **nom. nov.** pro *Ophiodermatidae*; VERRILL (244) p. 4.

Pluteus paradoxus; HAECKEL (115) pl. x.

Polypholis echinata, cf. post-larval growth-stage of *Ophiactis asperula*; LUDWIG (159) p. 222.

†*Protaster*, vide etiam sub IV, D. *P. decheni* confused with "*Agelacrinus*" Mourlon, 1881, its geological range; DEWALQUE (73), vide etiam BATHER (23). *P. granifer* Whidb. (sub *Eugaster*), Pilton beds, N. Devon, in Mus. Pract. Geol., now first descr. and figd., compared with *P. sedgwickii* (p. 207, pl. xxvi); *P.*? (*Drepanaster*) *scabrosus* Whidb., Pilton beds of Croyde and Braunton Down, N. Devon, in Barnstaple Athenæum and Mus. Pract. Geol., now first descr. and figd. (p. 208, pl. xxix) with var. from various localities (p. 208, pls. xxvii, xxviii), sp. allied to *P. forbesi*, with which it may form a distinct genus *Drepanaster*: WHIDBORNE (250).

Sigsbeia lineata, **n. sp.**, 0° 57′ S., 89° 38′ W., 53 fms., very nearly related to *S. murrhina*; LÜTKEN & MORTENSEN (162) p. 183, pl. xx. *S. murrhina*, variations from Lyman's figure; VERRILL (244) p. 72, pl. ii.

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(F.)—CRINOIDEA.

Origin and evolution of *Crinoidea*, with phylogenetic classification into Sub-class *Monocyclica*, with Orders *Inadunata*, *Adunata*, and *Camerata*, and Sub-class *Dicyclica*, with Orders *Inadunata*, *Flexibilia*, and *Camerata*; BATHER (22) pp. 918, 921. Classification of Wachsmuth & Springer (336) Zool. Rec. 1897, criticised; JAEKEL (129) p. 380. Classification, with reference to Palæozoic *Crin.* of Bohemia; WAAGEN & JAHN (246) pp. 9–11.

†*Abacocrinus*, vide *Xenocrinidae*.

†*Acacocrinus*, subgenus of W. & Sp., should be genus; BATHER (24) p. 122. †*Acacocrinus* vide *Carpocrinidae*.

†*Acanthocrinus*;—A. cf. *gregarius* (*longispina*) [sic] (p. 57); *A.* cf. *rex* (p. 10): FUCHS (100).

†*Achradocrinus*, vide *Gasterocomidae*.

†*Actinocrinidae*, W. & Sp., erected into sub-order *Actinocrinoidea*, and divided into *Actinocrinidae* (s. str.) and *Amphoracrinidae*; BATHER (22) p. 922, and (24) p. 121.

†*Actinocrinoidea*, **sub-ord. nov.** of *Camerata monocyclica*, incl. *Actinocrinidae* and *Amphoracrinidae*; BATHER (22) p. 922, and (24) p. 121.

†*Actinocrinus*:—*A.* ? *batheri* Whidb., Pilton beds of Braunton, in Mus. Pract. Geol. and of Sloly in Woodwardian Mus., now first descr. and figd. (p. 222, pl. xxxii); *A. porteri*, Whidb., Pilton beds of Braunton, Barnstaple, N. Devon, and Pilton, in Mus. Pract. Geol., Woodwardian Mus., and Porter Coll., now first descr. and figd., abnormality, parasitic *Capulus* (p. 220, pls. v, xxx, xxxi, xxxii): WHIDBORNE (250).

Actinometra sp., Rotuma; BELL (33) p. 849. *A. belli*, brachia of young; DOEDERLEIN (77) p. 479, pl. xxxvi. *A. bennetti*, and *A. grandicalyx* ?; BELL (32) p. 134. *A. parvicirra*; l. c.: brachia (p. 479, pl. xxxvi); *A. paucicirra*, brachia, distribution of syzygies, colour (p. 479); *A. pectinata*, cirri, brachia (p. 478); *A. regalis*, cirri, brachia, colour (p. 480); *A. solaris*, cirri, brachia, colour (p. 478): DOEDERLEIN (77). *A. typica*; BELL (32) p. 134.

Actinometridae, referred to *Flexibilia pinnata*; BATHER (22) p. 923.

†*Adelocrinus*, validity of genus discussed, referred to *Hexacrinidæ* (p. 223); *A. hystrix*, redescr. fr. holotype in Mus. Pract. Geol. and other specimens, perhaps is an *Arthracantha* (p. 224, pl. xxx): WHIDBORNE (250).

†*Adunata*, **ord. nov.** of *Crinoidea monocyclica*, defined, and divided into Group A. Fam. *Platycrinidae*, sub-Famm. *Coccocrininae*, *Cypellocrininae*, *Platycrininae*, and Group B. Fam. *Hexacrinidae*, *Acrocrinidae*; BATHER (22) p. 921, and (24) p. 119.

†*Aesiocrinus*, vide *Graphiocrinidae*.

†*Agassizocrinus*, vide *Cromyocrinidae*.

†*Allocrinus*, vide *Patelliocrinidae*.

†*Amphoracrinidae*, **n. fam.** pro *Amphoracrinus*, not further defined; BATHER (22) p. 922.

†*Ancyrocrinus bulbosus*; GRABAU (108) p. 285: "variously deformed individuals" [scilicet radices]; GRABAU (107) p. 146, fig. 28.

†*Anisocrinus*, vide *Taxocrinidae*.

Antedon, migration of anal; BATHER (24) pp. 33, 34, text-fig. 10. †*A.* sp. [from description appears to be *Bourguetier.* columnals], Lower Cenomanian, of Rucar, Valea lui Ecle, Roumania; POPOVICI-HATZEG (193) p. 4. *A. abyssicola*, evidence for bipolarity; THOMPSON (230) p. 321. *A. bidens*, cirri, brachia, covering-plates on genital pinnules, colour; DOEDERLEIN (77) p. 476, pl. xxxvi. *A. bifida*, vide *A. rosacea*. *A. elegans*, cirri, colour; DOEDERLEIN (77) p. 475, pl. xxxvi. *A. eschrichti*; ALBERT, Prince de MONACO (6) p. 214. *A. flagellata*, Zanzibar; LUDWIG (158) p. 538. *A. imparipinna*, brachia; DOEDER-

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LEIN (77) p. 477. *A. indica*; BELL (32) p. 133. *A. ludovici* (p. 477); *A. microdiscus*, cirri, brachia, tegminals, colour (p. 476, pl. xxxvi): DOEDERLEIN (77). *A. phalangium*; ALBERT, Prince de MONACO (6) p. 214: breeding period, depths, parasites; LO BIANCO (147) p. 469. *A. rhomboidea*, about 30 metres, Smyth Channel, Patagonia; LUDWIG (156). *A. rosacea* [i.e. *bifida*], origin of sexual cells; RUSSO (204): breeding period; AURIVILLIUS (21) p. 11: breeding period, habitat, parasites; LO BIANCO (147) p. 469. †*A. schlumbergeri* from Luc- and Lion-sur-Mer, differences from type, young with IBB; BIGOT (39) p. 67. *A. tuberculata*; BELL (32) p. 133.

Antedonidae, incl. *Antedon*, *Thiollierior.*, *Eudiocr.*, *Promachocr.*, referred to *Flexibilia Pinnata*; BATHER (22) p. 923.

†*Aorocrinus*; BATHER (24) p. 122: vide *Coelocrinus*.

Apiocrinidae, referred to *Flexibilia Pinnata*; BATHER (22) p. 923.

†*Ascocystis* is a primitive Camerate, and has open food-grooves on tegmen; JAEKEL (129) p. 378.

Atelecrinidae, **n. fam.** of *Flexibilia Pinnata*; BATHER (22) p. 923.

†*Atelestocrinus*, anal area; BATHER (24) p. 36: vide *Botryocrinidae*.

†*Aulocrinus*, forked anal tube, ? due to commensal; BATHER (24) p. 121.

†*Austinocrinus*:—*A. erckerti* (p. 57, pl. ii). *A. radiatus*, **n. sp.**, Senonian, Daghestan (p. 58, pl. ii): ANTHULA (18).

†*Bactrocrinus*, vide *Palaeocrinidae*.

Bathycrinidae, doubtfully referred to *Dendrocrinoidea*, incl. only *Bathycr.*; BATHER (22) p. 922.

†*Batocrinidae* W. & Sp. erected into suborder *Batocrinoidea* and divided into *Tanaocrinidae*, *Xenocrinidae*, *Carpocrinidae*, *Barrandeocrinidae*, *Coelocrinidae*, *Batocrinidae* (s. str.), *Periechocrinidae*; BATHER (24) p. 121: *Batocrinidae*, incl. *Batocr.* and *Hyperocr.* (q.v.), fam. of *Batocrinoidea*; BATHER (22) p. 922, and (24) p. 121.

†*Batocrinoidea*, **sub-ord. nov.** of *Camerata monocyclica*, defined, incl. *Tanaocrinidae*, *Xenocrinidae*, *Carpocrinidae*, *Barrandeocrinidae*, *Coelocrinidae*, *Batocrinidae*, *Periechocrinidae*; BATHER (22) p. 922.

†*Batocrinus*, number of rami; *B. turbinatus* et var. *elegans*, locality of types: BATHER (24) p. 125.

†*Beyrichocrinus*, **n. g.**, with genotype *B. humilis*, **n. sp.**, Silurian f 2, Konieprus, Bohemia; WAAGEN & JAHN (246) p. 12, text-figg., pls. lix, lx.

†*Bohemicocrinus*, **n. g.**, with genotype *B. pulverens* [sic], **n. sp.**, Silurian, e 2 and black limestone, Kosor and Dvoretz, Bohemia; WAAGEN & JAHN (246) p. 15, text-figg., pls. lvii, lxi, lxii.

†*Botryocrinidae*, incl. *Botryocr.*, *Gothocr.*, *Mastigocr.*, *Gastrocr.*, *Rhadinocr.*, *Goniocr.*, *Atelestocr.*, *Streptocr.*, referred to *Dendrocrinoidea*; BATHER (22) p. 922.

Bourgueticrinidae, incl. *Bourgueticr.*, *Mesocr.*, *Rhizocr.*, referred to *Flexibilia Pinnata*; BATHER (22) p. 923.

†*Bourgueticrinus*?; TOULA (232) p. 67. *B. ellipticus*; DIBLEY (75); KLOOS (138): crystallography of columnals; CESARO (54) p. 99. [V. *Antedon* sp.]

†*Briarocrinus*, vide *Patelliocrinidae*.

†*Bursacrinus*, vide *Scaphiocrinidae*.

†*Cactocrinus* (p. 122); *C. obesus* (p. 125): BATHER (24).

Calamocrinus referred to *Apiocrinidae*; BATHER (22) p. 923. *C. diomedae*, anal tube and interbrachials; BATHER (24) p. 43, text-fig. 19.

†*Caleidocrinus*, **n. g.** (p. 106, text-figg. 27–32), with genotype *C. multiramus*, **n. sp.** (p. 113, pl. lxiii, text-figg. 27–30), also *C. barrandei*, **n. sp.** (p. 112, text-fig. 31), all Ordovician, d 4, near Zahorzan, Bohemia; WAAGEN & JAHN (246).

†*Calpiocrinus*, vide *Dactylocrinidae*. *C.? bohemicus*, **n. sp.**, Silurian, e 2 of

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Vyskočilka near Klein-Kuchel, Bohemia; WAAGEN & JAHN (246) p. 20, pls. lix, lxxix.

†*Camerata*, criticism of Wachsmuth & Springer's conception, definition, and classification; BATHER (24) p. 118.

†*Camerata dicyclica*, **ord. nov.**, defined, incl. *Reteocrinidae*, *Dimerocrinidae*, *Lampterocrinidæ*, *Rhodocrinidae*; BATHER (22) p. 923.

†*Camerata monocyclica*, **ord. nov.**, defined, and divided into sub-orders *Melocrinoidea*, *Batocrinoidea*, and *Actinocrinoidea*, qq. v.; BATHER (22) p. 921.

†*Camptocrinus*, stem discussed; BATHER (24) p. 122.

†*Carabocrinidae* referred to *Cyathocrinoidea*; BATHER (22) p. 922.

†*Carolicrinus*, **n. g.**, with genotype *C. barrandei*, **n. sp.**, black limestone of Karlstein and e 2, Lochkov, Bohemia; WAAGEN & JAHN (246) p. 22, text-figg., pls. lviii, lxvi.

†*Carpocrinidae*, incl. *Carpocr.*, *Acacocr.*, *Desmidocr.*, *Macarocr.*, referred to *Batocrinoidea*; BATHER (22) p. 922.

†*Carpocrinus*, name preferred to *Habrocrinus* (q. v.); BATHER (24) p. 127.

†*Centriocrinus*, **nom. mut.**, pro *Centrocrinus* Wachsm. & Spr. non Austin nec Worthen, referred to *Patelliocrinidae*; BATHER (22) p. 922, and (24) p. 127.

†*Ceriocrinus* White non Desor nec König = *Delocr.* Miller & Gurley; BATHER (24) p. 32, vide etiam *Graphiocrinidae*. *C. monticulatus*, **n. sp.**, shales above Osage coal at Capital coal mine near Topeka, Kansas; BEEDE (30) Kansas quart. viii, p. 123, pl. xxxii. *C. nodulifera* [sic], n. sp., Upper Coal Measures, Kansas City, Mo.; BUTTS (50), Tr. Acad. Sci. Kansas, i, p. 13 and pl.

†*Cleiocrinus*, vide *Impinnata*.

†*Clidochirus*, vide *Ichthyocrinidae*.

†*Clonocrinidae*, **n. fam.**, incl. *Clonocr.* (q. v.), *Trybliocr.*, *Technocr.*; BATHER (22) p. 922.

†*Clonocrinus* Quenst. non Oehlert, precedes *Corymbocr.* Ang.; BATHER (22) p. 922, and (24) p. 127.

†*Coccocrininae*, sub-fam. of *Platycrinidae*, incl. *Coccocr.*, *Hapalocr.*, *Cordylocr.*; BATHER (22) p. 921.

†*Codiacrinidae*, incl. *Codiacr.* and *Lecythiocr.*, referred to *Cyathocrinoidea*; BATHER (22) p. 922.

†*Coeliocrinus*, vide *Scaphiocrinidae*. *C.*, sp. ind., "a mass of arms," Pilton beds, Barnstaple, Woodwardian Mus.; WHIDBORNE (250) p. 236, pl. xxxviii.

†*Coelocrinidae*, incl. *Coelocr.* (q. v.), *Dorycr.*, *Agaricocr.*, **n. fam.** of *Batocrinoidea*; BATHER (22) p. 922.

†*Coelocrinus* Meek & Worthen, antedates *Aorocrinus* W. & Sp.; BATHER (22) p. 922 and (24) p. 127.

†*Compsocrinus*, vide *Xenocrinidae*.

†*Cordylocrinus plumosus*; BATHER (24) p. 125.

†*Corymbocrinus* Ang., syn. of *Clonocr.* (q. v.); BATHER (24) p. 127.

†*Cosmocrinus*, **n. g.** of *Botryocrinidae*, to include *Poteriocrinus dilatatus* Schultze, *Cyathocrinus ornatissimus* Hall, and *C. holzapfeli*, **n. sp.**, Upper Devonian of Nehden; JAEKEL (128).

Crinoidea, defined, and divided into sub-classes *Monocyclica* and *Dicyclica* qq. v.; BATHER (22) p. 921.

†*Cromyocrinidae*, incl. *Cromyocr.*, *Eupachycr.*, *Agassizocr.*, *Tribrachiocr.*, *Phialocr.*, *Ulocr.*, referred to *Dendrocrinoidea*; BATHER (22) p. 922.

†*Crotalocrinidae*, referred to *Cyathocrinoidea*; BATHER (22) p. 922; not Camerata, but allied to *Gissocrinus*; JAEKEL (129) p. 382.

†*Crotalocrinus*; KAYSER & HOLZAPFEL (132) p. 507. *C. rugosus*; VENYUKOV (239) p. 94.

†*Ctenocrinus typus*, var. *intropunctata* nom. nud.; FUCHS (100) p. 57.

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†*Culicocrinus* cf. *nodosus*; Fuchs (100) p. 57.
†*Cupellaecrinus*, see *Cypellocrinus*.
†*Cupressocrinidae*, referred to *Cyathocrinoidea*; Bather (22) p. 922.
†*Cyathidium holopus*, colony, over 100 individuals bent in same direction; Hennig (119) p. 116, text-fig. 21.
†*Cyathocrinidae*, incl. *Cyathocr.*, *Gissocr.*, *Lecythocr.*, referred to *Cyathocrinoidea*; Bather (22) p. 922.
†*Cyathocrinoidea*, **sub-ord. nov.** defined, incl. *Carabocrinidae*, *Palaeocrinidae*, *Euspirocrinidae*, *Sphaerocrinidae*, *Cyathocrinidae*, *Petalocrinidae*, *Crotalocrinidae*, *Codiacrinidae*, *Cupressocrinidae*, *Gasterocomidae*: Bather (22) p. 922.
†*Cyathocrinus*:—*C.*, sp. indet., columnals, Permo-carboniferous of Yarkalo, in Lant-san-kiang valley, China (p. 116, pl. iv), of Tali-schau in Yunnan, China (p. 123, pl. v), of Pu-pjao in Yunnan, China (p. 132, pl. vi), Upper Carboniferous, Teng-tjan-tsching near Kan-tschou-fu, China (p. 98, pl. iii); Lóczy (149). *C.*, cf. *grebei*; Fuchs (100) p. 32. *C. longimanus*, anal area; Bather (24) p. 35, text-fig. 15. *C. ornatissimus*, see *Cosmocrinus*.
†*Cypellocrininae*, sub-fam. of *Platycrinidae* for *Cypellocr.* q.v.; Bather (22) p. 921.
†*Cypellocrinus* Shumard, resuscitated for *Marsupiocrinus* Phillips non Blainville [but *Cypellocr.* being preoccupied by Steininger, must yield to *Marsipocrinus* Bather, 1889]; Bather (22) p. 921 and (24) p. 127.
†*Cyphocrinus gorbyi* Miller antedates *Hyptiocrinus typus* W. & Sp.; Bather (24) p. 126.
†*Cyrtidocrinus*, vide *Ichthyocrinidae*.
†*Dactylocrinidae*, incl. *Dactylocr.*, *Calpiocr.*, *Lithocr.*, *Synerocr.*, *Euryocr.*, *Onychocr.*, **n. fam.** of *Flexibilia Impinnata*; Bather (22) p. 923.
†*Dadocrinus*, vide *Pentacrinidae*.
†*Decadocrinus*, vide *Scytalecrinidae*.
†*Delocrinus*, name preferred to *Ceriocr.* (q.v.), anal area, analysis of cup; Bather (24) pp. 32, 33, text-fig. 9.
†*Dendrocrinidae*, incl. *Dendrocr.*, *Merocr.*, *Ottawacr.*, *Homocr.*, *Thenarocr.*, referred to *Dendrocrinoidea*; Bather (22) p. 922.
Dendrocrinoidea, **sub-ord. nov.** of *Dicyclica*, defined, incl. *Dendrocrinidae*, *Botryocrinidae*, *Lophocrinidae*, *Scaphiocrinidae*, *Scytalecrinidae*, *Graphiocrinidae*, *Cromyocrinidae*, *Encrinidae*, *Pentacrinidae*, *Uintacrinidae*, *Marsupitidae*, and (?) *Bathycrinidae*; Bather (22) p. 922.
†*Dendrocrinus*:—*D. casei* and *D. longidactylus*, anal area; Bather (24) p. 35, text-figg. 13 and 12.
†*Desmidocrinus*, vide *Carpocrinidae*.
†*Diabolocrinus*; Bather (24) p. 122.
†*Diamenocrinus gonatodes*; Fuchs (100) pp. 6, 13, 22, 48, 91.
Dicyclica, **sub-class nov.**, defined, and divided into Orders Inadunata, Flexibilia, and Camerata, qq.v.; Bather (22) p. 922.
†*Dimerocrinidae*, incl. *Dimerocr.*, *Ptychocr.*, *Orthocr.*, *Hyptiocr.*, referred to *Camerata Dicyclica*; Bather (22) p. 923.
†*Dimerocrinus*, name preferred to *Thysanocr.*; Bather (24) p. 126.
†*Dizyzocrinus*; Bather (24) p. 122.
†*Dolatocrinus liratus*; Bownocker (46) p. 20.
†*Dorycrinus*?, sp., spines; Grabau (107) p. 143, fig. 24 *i*.
†*Ectenocrinus*, anal area; Bather (24) pp. 36, 41.
†*Edriocrinus*, vide Impinnata.
†*Encrinidae*, incl. *Encr.*, *Stemmatocr.*, *Erisocr.*, referred to *Dendrocrinoidea*; Bather (22) p. 922.
†*Encrinites**, a general term for undeterminable fragments other than

* Note to *Encrinites* and *Entrochus*. These are not intended as generic names,

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columnals:—*E.* [err. pro *Entrochus*] sp., Ordovician, d 3 (p. 145, pl. lxxix); *E. anonymus*, Silurian, e 1, Tachlovic (pp. 134, 186, pl. lxx); *E.* [err. pro *Entrochus*] *artifex*, Ordovician, d 5 (p. 183, pl. lxxvii); *E. betula*, Silurian, e 2 (p. 155, pl. lxxvii); *E.* [err. pro *Entrochus*] *binarius*, Ordovician, d 2 (p. 144, pl. lxxix); *E.* [err. pro *Entrochus*] *fenestratus*, Ordovician, d 5 (pp. 143, 185, pl. lxxix); *E. gemmans*, Devonian, g 1 (p. 157, pl. lxxix); *E. inexplicatus*, Silurian, f 2, Konieprus (p. 132, pl. lix); *E. inflatus*, Devonian, g 1 (p. 158, pl. lxxix); *E. medullosus*, Silurian, e 1–2 and e 2 (pp. 158, 186, pls. lxx and lxxix); *E. nepos*, Silurian, e 2 (p. 152, pl. lxxvi); *E. nudus*, Devonian, g 2 (p. 156, pl. lxxix); *E.* [err. pro *Entrochus*] *petasus*, Ordovician, d 5 (p. 186, pl. lxxix); *E. praecursor*, Silurian, e 2 (p. 155, pl. lxxvii); *E. procerus*, Silurian, e 1–2, Dvoretz, etc. (pp. 135, 148, 187, pl. lxx); *E.* [err. pro *Entrochus*] *rotator*, Ordovician, d 4 (p. 144, pl. lxxix); *E. st. ivanensis*, Silurian, e 2 (p. 152, pl. lxxvi); *E. scopularum*, Silurian, e 2, Lodenic (p. 118, pl. lxxvii); *E. stringens*, Devonian, g 2 (p. 156, pl. lxxix); *E.* [err. pro *Entrochus*] *subpartitus*, Ordovician, d 3 (p. 145, pl. lxxix); *E. textus* [4 times] seu *tectus* [5 times], Silurian, e 1–2, Dvoretz and Karlstein (p. 132, pl. lxv); *E. turgidus*, Silurian, f 2 (p. 151, pl. lxxiv); *E. versatilis*, Devonian, h 1 (p. 156, pl. lxxix): all Bohemia; Waagen & Jahn (246).

†*Encrinus*:—*E.* nov. form. indet. (p. 10, pl. i); *E. granulosus* (p. 9, pl. i): Tommasi (231). *E. liliiformis*, Mid. Trias of Tschung-tjen, China, columnals; Lóczy (149) p. 160, pl. x: growth of arms; Jackson (127) p. 128.

†*Entrochus**, general term for indeterminable columnals:—*E. anonymus*, Silurian, e 1 (p. 148, pl. lxx); *E. artifex*, Ordovician, d 5 (p. 140, pl. lxxvii); *E. bulbosus*, Silurian, f 2 (p. 146, pl. lx); *E. doctus*, Silurian, e 1–2 (p. 151, pl. lxxii); *E. laetus*, Ordovician, d 5 (p. 142, pl. lxxix); *E. margaritarum*, Silurian, e 1–2 (p. 149, pl. lxxi); *E. medullosus*, Silurian, e 1–2 (p. 148, pl. lxx); *E. milleporus*, Ordovician, d 5 (p. 142, pl. lxxvii); *E. nudulosus* [sic], Silurian, f 2 (p. 145, pl. lx); *E. nympharum*, Silurian, e 1–2 (p. 150, pl. lxxi); *E. placidus*, Silurian, e 1–2 (p. 149, pl. lxxi); *E. praecursor*, Ordovician, d 4, 5, and Silurian, e 2 (p. 141, pl. lxxvii); *E. primus*, Ordovician, d 1 (p. 182, pl. lxiii); *E. robustissimus*, Silurian, f 2 (p. 146, pl. lx); *E. runicus*, Silurian, e 1–2 (p. 150, pl. lxxii); *E. senior*, Silurian, e 1–2 (p. 148, pl. lxxi); *E. simplicior*, Silurian, e 1–2 (p. 147, pl. lxix): all Bohemia; Waagen & Jahn (246).

†*Erisocrinus*, vide *Encrinidae*. *E. megalobrachius*, **n. sp.**, Osage coal, Upper Coal Measures, Topeka, Kansas; Beede (30), Kansas quart. viii, p. 124, pl. xxxii. *E. toddanus*, **n. sp.**, Upper Coal Measures, Kansas City, Mo.; Butts (50) Tr. Acad. Sci. Kansas, i, p. 14 and pl.

†*Eudesicrinidae*, referred to *Flexibilia Pinnata*; Bather (22) p. 923.

Eudiocrinus, vide *Antedonidae*.

†*Eugeniacrinidae*, referred to *Flexibilia Pinnata*; Bather (22) p. 923.

†*Eupachycrinus*, vide *Cromyocrinidae*.

†*Euryocrinus*, vide *Dactylocrinidae*.

†*Euspirocrinidae*, referred to *Cyathocrinoidea*; Bather (22) p. 922.

†*Eutrochocrinus*; Bather (24) p. 122.

Flexibilia, **ord. nov.** of *Dicyclica*, defined, and divided into grades, *Pinnata* and *Impinnata*, qq.v.; Bather (22) p. 922.

†'*Forbesiocrinus*' *agassizi*, referred to *Sagenocrinidae*; Bather (22) p. 923.

F. nuntius, vide *Taxocrinus*.

and the names indexed under them are not to be regarded as n. spp., since they are merely given by Waagen & Jahn as MS. names of Barrande, having no scientific validity.

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†*Gasterocomidae*, incl. *Gasterocoma*, *Scolocr.*, *Achradocr.*, *Hypocr.*, referred to *Cyathocrinoidea*; BATHER (22) p. 922.
†*Gastrocrinus*, vide *Botryocrinidae*. *G. patulus*?; FUCHS (100) p. 52.
†*Gazacrinidae*, vide *Idiocrinidae*.
†*Gazacrinus inornatus* Miller antedates *Idiocr. elongatus*; BATHER (24) p. 126.
†*Gennaeocrinus*:—*G. eucharis*, plates; GRABAU (107) p. 142, fig. 24, and (108) p. 285. *G. nyssa*, plates, implicitly this name is preferred to *G. kentuckiensis*; GRABAU (107) p. 141 and fig. 23, see also (108) p. 285.
†*Gilbertsocr. dispansus* W. & Sp., syn. of *G. lyonanus* Miller; BATHER (24) p. 126.
†*Gissocrinus*, vide *Cyathocrinidae*.
†*Glyptocrinus decadactylus*, interradial and anal areas; BATHER (24) p. 32, text-fig. 1.
†*Gnorimocrinus*, defined by reference to *Taxocrinus expansus* Angelin as genotype, and referred to *Taxocrinidae*; BATHER (22) p. 923.
†*Goniocrinus*, vide *Botryocrinidae*.
†*Gothocrinus*, vide *Botryocrinidae*.
†*Graphiocrinidae*, incl. *Graphiocr.*, *Aesiocr.*, *Ceriocr.* White, referred to *Dendrocrinoidea*; BATHER (22) p. 922.
†*Habrocrinus* [nomen *Carpocrinus* preferendum est] *pentadactylus*, **n. sp.**, Moscow shale of Hamilton Group in W. New York; GRABAU (107) p. 143, fig. 25 [brachia vero non 'pentadactyla,' nec Carpocrini brachiis similia].
†*Hadrocrinus pentadactylus*, nom. nud.; GRABAU (108) p. 285.
†*Haplocrinus boitardi* Rouault [?nom. nov. et nud.] "désignée par Rouault [?sur les étiquettes] *Eugeniacrinites boitardi*," Devonian of Ille-et-Vilaine; KERFORNE (135) p. 344.
†*Herpetocrinus*; BATHER (22) p. 921, and (24) p. 122.
†*Heterocrinus*:—*H. bellevillensis*, anal area, analysis of cup (pp. 33, 41, text-fig. 5); *H. isodactylus* (?=*Ohiocr. compactus*), anal area (p. 41, text-fig. 17): BATHER (24).
†*Holocrinus*, vide *Pentacrinidae*.
Holopodidae, referred to *Flexibilia Pinnata*; BATHER (22) p. 923.
†*Homalocrinus*, vide *Taxocrinidae*.
†*Homocrinus*, vide *Dendrocrinidae*: anal area, analysis of cup; BATHER (24) p. 33, text-fig. 7.
†*Hybocrinus*, anal area, analysis of cup; BATHER (24) pp. 33, 44, text-fig. 6.
†*Hybocystis* Wetherby non Benson, referred to *Hybocrinidae*; BATHER (22) p. 921: anal; BATHER (24) p. 44.
†*Hyperocrinus* Meek & Worthen (as *Uperocr.*) precedes *Lobocr.* W. & Sp., referred to *Batocrinidae*; BATHER (22) p. 922, & (24) p. 126.
†*Hypocrinus*, vide *Gasterocomidae*.
†*Hyptiocrinus*, vide *Dimerocrinidæ*: is syn. of *Cyphocrinus*; BATHER (24) p. 126.
†*Ichthyocrinidae*, incl. *Ichthyocr.*, *Pycnosaccus*, *Lecanocr.*, *Cyrtidocr.*, *Clidochirus*, *Mespilocr.*, referred to *Flexibilia Impinnata*; BATHER (22) p. 923.
†*Ichthyocrinus*? sp. ind., Silurian, f. 2, Konieprus, Bohemia; WAAGEN & JAHN (246) p. 29, pls. lx, lxi.
†*Idiocrinidae* [melius *Gazacrinidae*] referred to *Flexibilia Impinnata* [probably in error]; BATHER (22) p. 923.
†*Idiocrinus* is syn. of *Gazacrinus* (p. 126), removed from *Thysanocrinidae* to ?*Flexibilia* (p. 120); *I. ventricosus* (p. 125): BATHER (24).
†*Impinnata*, grade of *Flexibilia*, incl. *Ichthyocrinidae*, *Idiocrinidae*, *Taxo-*

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crinidae, *Dactylocrinidae*, *Sagenocrinidae*, also *Edriocr.*, *Cleiocr.*, and *Rhopalocr.*; BATHER (22) p. 923.

Inadunata dicyclica, **ord. nov.**, defined and divided into sub-orders *Cyathocrinoidea* and *Dendrocrinoidea*, qq. v.; BATHER (22) p. 922.

Inadunata monocyclica, **ord. nov.**, defined, incl. *Hybocrinidae*, *Stephanocrinidae*, *Heterocrinidae*, *Calceocrinidae*, *Pisocrinidae*, *Catillocrinidae*, *Zophocrinidae*, *Haplocrinidae*, *Allagecrinidae*, *Symbathocrinidae*, *Belemnocrinidae*, *Plicatocrinidae*, *Hyocrinidae*, *Saccocomidae*; BATHER (22) p. 921.

†*Iocrinus subcrassus*, anal area; BATHER (24) pp. 35, 42, text-fig. 11, 18.

Isocrinus accepted as the correct name for *Pentacrinus* Auctt. recentt. (p. 66); †*I. nicoleti*, colonies at Lion-sur-mer, persistence of IBB: BIGOT (39) pp. 66, 70. Vide etiam sub *Pentacrinus*.

†*Lampterocrinidae*, incl. *Lampterocr.* and *Siphonocr.*, **n. fam.** of *Camerata dicyclica*; BATHER (22) p. 923, & (24) p. 120.

†*Lampterocrinus*, brachia; BATHER (24) p. 125.

†*Laubeocrinus*, **n. g.** with genotype *L. barrandei*, **n. sp.**, Silurian, e 2, near Lochkov, Bohemia; WAAGEN & JAHN (246) p. 31, text-figg., pls. lix, lx.

†*Lecanocrinus*, vide *Ichthyocrinidae*.

†*Lecythiocrinus*, vide *Codiacrinidae*.

†*Lecythocrinus*, vide *Cyathocrinidae*.

†*Lithocrinus*, defined by reference to *Forbesiocrinus divaricatus* Angelin as genotype and referred to *Dactylocrinidae*; BATHER (22) p. 923.

†*Lobocrinus* W. & Sp. is syn. of *Hyperocrinus* (q. v.); BATHER (24) p. 126.

†*Lophocrinidae*, referred to *Dendrocrinoidea*; BATHER (22) p. 922.

†*Lyriocrinus*, basals; BATHER (24) p. 125.

†*Macarocrinus*, vide *Carpocrinidae*.

†*Macrocrinus*; BATHER (24) p. 122.

†*Macrostylocrinus*, vide *Patelliocrinidae*.

†*Mariocrinus*? *mundus*, **n. sp.**, Pilton beds of Croyde, Whidborne coll., and ?of Braunton, Barnstaple Athenæum; WHIDBORNE (250) p. 219, pls. xxxiv, xxxvii.

†*Marsipocrinus*, vide sub *Cypellocrinus*.

†*Marsupiocrinus*, vide sub *Cypellocrinus*.

†*Marsupites*, range in Yorkshire; LAMPLUGH (145) p. 31. *M. ornatus*; ANON (15 & 16); FRUCHT (99); KLOOS (138): in Algeria; PERON (189) p. 510; LAMBERT in review compares this with specimens from Luneburg rather than from Sussex.

†*Marsupitidae*, referred to *Dendrocrinoidea*; BATHER (22) p. 922.

†*Mastigocrinus*, vide *Botryocrinidæ*.

†*Melocrinidae* W. & Sp., erected into sub-order *Melocrinoidea* and divided into *Glyptocrinidae*, *Melocrinidae* (s. str.), *Patelliocrinidae*, *Clonocrinidae*, *Eucalyptocrinidae*, *Dolatocrinidae*; BATHER (24) p. 121.

†*Melocrinoidea*, **sub-ord. nov.** of *Camerata monocylica*, defined, incl. Famm. *Glyptocrinidae*, *Melocrinidae*, *Patelliocrinidae*, *Clonocrinidae*, *Eucalyptocrinidae*, *Dolatocrinidae*; BATHER (22) p. 922, and (24) p. 121.

†*Megistocrinus*:—*M.* (?), sp., Pilton beds, Barnstaple; WHIDBORNE (250) p. 218, pl. xxxvii. *M. spinulosus*; BOWNOCKER (46) p. 20.

†*Merocrinus*, vide *Dendrocrinidae*: anal area, analysis of cup; BATHER (24) p. 33, text-fig. 4.

†*Mesocrinus*, vide *Bourgueticrinidae*.

†*Mespilocrinus*, vide *Ichthyocrinidae*.

Metacrinus angulatus; HAECKEL (115) pl. xx. *M. rotundus*, growth of stem; JACKSON (127) p. 127.

†*Millericrinus horridus*; SEMENOV (212) p. 80.

†*Missouricrinus*, referred to *Belemnocrinidæ*; BATHER (22) p. 921.

Monocyclica, **sub-class. nov.**, incl. Orders *Inadunata*, *Adunata*, *Camerata*, qq. v.; BATHER (22) p. 921.

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†*Myelodactylus*; BATHER (24) p. 122.
†*Myrtillocrinus*, vide etiam *Ancyrocrinus*.
†*Onychocrinus*, vide *Dactylocrinidae*.
†*Orthocrinus*, vide *Dimerocrinidae*.
†*Ottawacrinus*, vide *Dendrocrinidae*.
†*Palaeocrinidae*, incl. *Palaeocr.*, *Porocr.*, *Bactrocr.*, **n. fam.** of *Cyathocrinoidea*; BATHER (22) p. 922.
†*Pariscrinus*, vide *Sphaerocrinidae*: new diagram posterior side; BATHER (24) p. 35, text-fig. 16.
†*Patelliocrinidae*, incl. *Patelliocr.*, *Stelidiocr.*, *Macrostylocr.*, *Allocr.*, *Briarocr.*, *Centriocr.*, **n. fam.** of *Melocrinoidea*; BATHER (22) p. 922.
Pentacrinidae, incl. *Dadocr.*, *Holocr.*, and sub-fam. *Pentacrininae*, referred to *Dendrocrinoidea*; BATHER (22) p. 922.
Pentacrinus seu *Extracrinus*, vide etiam *Isocrinus*. †*P. annulatus*; LAMPLUGH (144) pp. 592, 599, 616. †*P. asteriscus*, incl. *P. whitei* Clark, Yellowstone Park; STANTON (221) p. 608. †*P. sp. ind. aff. carinatus*, columnals, Daghestan; ANTHULA (18) p. 57. *P.* (*Isocr.*) *decorus*, growth of stem; JACKSON (127) p. 127. †*P. legeri*, **n. sp.**, Upper Aptian of Ile Maïre near Marseilles, "Fragment d'un bras [*errore pro* tige] de Pentacrine composé de cinq articles" [at least 6, and possibly 11, are figured]; REPELIN (197) p. 364, pl. vii. *P.* (*Isocr.*) *maclearanus*; HAECKEL (115) pl. xx. †*P.* (*Isocr.*) *nicoleti*; SCHALCH (208) p. 733. †*P.* (*Isocr.*) *scalaris*; THOMPSON (229) p. 87. †*P.* (*Isocr.*) *stellatus*, at Castle Cove, Victoria; HALL & PRITCHARD (117) p. 50. †*P.* (*Extracr.*) *subangularis*; THOMPSON (229) p. 87. †*P.* (*Isocr.*) *tuberculatus*; THOMPSON (229) pp. 73, 87. *P.* (*Isocr.*) *wyville-thomsoni*; HAECKEL (115) pl. xx; ALBERT, Prince de MONACO (5) p. 313.
†*Periglyptocrinus*; BATHER (24) p. 122.
†*Petalocrinidae*, referred to *Cyathocrinoidea*; BATHER (22) p. 922.
†*Phialocrinus*, vide *Cromyocrinidae*.
†*Phimocrinus*, referred to *Symbathocrinidae*; BATHER (22) p. 921.
Pinnata, grade of *Flexibilia*, defined, incl. *Apiocrinidae*, *Bourgueticrinidae*, *Antedonidae*, *Atelecrinidae*, *Actinometridae*, *Thaumatocrinidae*, *Eugeniacrinidae*, *Holopodidae*, *Eudesicrinidae*; BATHER (22) p. 923.
†*Platycrinidae*, divided into subfamm. *Coccocrininae*, *Cypellocrininae*, and *Platycrininae*; BATHER (22) p. 921.
†*Platycrinus*:—*P.*? *anguliferus*, **n. sp.**, Pilton beds of Saunton, Swamy coll., of Top Orchard, Roborough, and Pilton, Porter coll., of Ashhill Quarry and Croyde, Whidborne coll.; WHIDBORNE (250) p. 223, pl. xxxvii. *P. eriensis*; GRABAU (107) p. 144. *P. symmetricus*; GIRTY (105) p. 515: growth of stem; JACKSON (127) p. 127.
†*Porocrinus*, vide *Palaeocrinidae*.
†*Poteriocrinus*, vide *Scaphiocrinidae*: discussion of Wachsmuth & Springer's action regarding this genus (p. 225); *P.* sp., Pilton beds, N. Devon (p. 228, pls. xxxv, xxxvi): WHIDBORNE (250). *P.* sp. indet. columnal, Permo-carboniferous of Tali-schau in Yunnan, China (p. 123, pl. v); of Young-tschang-fu in Yunnan, China (p. 129, pl. vi); LÓCZY (149). *P. barumensis* Whidb. (sub *Cyathocr.*), Pilton beds, Top Orchard and Barnstaple, Woodwardian Mus., Fremington, Partridge and Porter coll., now first descr. and figd.; WHIDBORNE (250) p. 227, pls. xxxiv, xxxv. *P. dilatatus* Schulze non Hall, vide *Cosmocrinus*. *P. tensus* Whidb., Pilton beds of Barnstaple, Woodwardian Mus. (type), of Saunton, Partridge coll., of Pilton, Porter coll., now first descr. and figd.; WHIDBORNE (250) p. 226, pls. xxxv, xxxviii.
Promachocrinus, vide *Antedonidae*.
†*Ptychocrinus*, vide *Dimerocrinidae*.
†*Pycnosaccus*, vide *Ichthyocrinidae*.
†*Reteocrinidae* W. & Sp., heterogeneous, restr. to *Reteocr.* and referred to

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Camerata dicyclica; BATHER (22) p. 923, & (24) pp. 119, 120: not a phyletic entity; JAEKEL (129) p. 382.

†*Rhadinocrinus*, vide *Botryocrinidæ*.

†*Rhaphanocrinus*, brachia, basals; BATHER (24) p. 125.

Rhizocrinus, vide *Bourgueticrinidae*. †*R. cornutus*; FUGGER (101) p. 393.

†*Rhodocrinidae*, referred to *Camerata dicyclica*; BATHER (22) p. 923.

†*Rhodocrinus*:—*R.*? sp. ind., Pilton beds of N. Devon; WHIDBORNE (250) p. 217, pl. xxxi. *R.*? *rectus* Hall (olim *Crinocystis*); WHITFIELD & HOVEY (254) p. 94.

†*Rhopalocrinus*, vide *Impinnata*.

†*Sagenocrinidae*, incl. *Sagenocr.* and 'Forbesiocr.' *Agassizi*, referred to *Flexibilia Impinnata*; BATHER (22) p. 923.

†*Scaphiocrinidæ*, incl. *Scaphiocr.*, *Poteriocr.*, *Woodocr.*, *Zeacr.*, *Coeliocr.*, *Bursacr.*, referred to *Dendrocrinoidea*; BATHER (22) p. 922.

†*Scaphiocrinus*:—*S.*? sp.; GIRTY (105) p. 516: Pilton beds of N. Devon; WHIDBORNE (250) p. 231, pl. xxxiv. *S. elegans*, anal area; BATHER (24) p. 35, text-fig. 14. *S.*? *inordinatus*, **n. sp.**, Pilton beds of Upcott Arch, Whidborne coll., and doubtful specimens from Barnstaple, Poleshill, and Braunton, first anal is in basal circlet (p. 230, pls. xxxiv, xxxv, xxxviii); *S.*? *plumifer*, **n. sp.**, Pilton beds of Barnstaple, Woodwardian Mus., of Braunton, Barnstaple Athenæum and Mus. Pract. Geol., of Pilton, Swamy coll. (p. 228, pls. xxxi, xxxiii, xxxvi, xxxviii); *S. salebrosus*, **n. sp.**, Pilton beds of Pilton, Porter coll., of Barnstaple, Woodwardian Mus., of Upcott, Barnstaple Athenæum, approaches *Cromyocrinus* (p. 232, pl. xxxvii); *S. transcisus*, **n. sp.**, Pilton beds of Barnstaple, Woodwardian Mus., of Pilton, Porter coll. (p. 230, pl. xxxviii): WHIDBORNE (250).

†*Scolocrinus*, vide *Gasterocomidae*.

†*Scyphocrinus*, general discussion and history of the genus and division into spp. and varr. (pp. 35–78, with text-figg.); *S.* sp.? various tegmina, plates and brachia (pp. 119–131, 134, 146, 186, pls. xlix, l, lii, lv, lxii, lxiv, lxv, lxvi, lxvii, lxviii, lxix, lxxi, lxxviii); *S.* sp. ind., numerous fragments, e 1–2, Bohemia (pp. 92–97, pls. xl, xli, xlvi, xlvii, xlviii, lii, lvi, lvii, lxii, lxiv); *S. decoratus*, **n. sp.**, Silurian, black limestone of Dvoretz, Bohemia (p. 88, pls. xl, xli, xlvii, text-fig. 25), and **var.**, ibid. (p. 91, pl. xli); *S. excavatus* (p. 80) cum **var. nov.** *Zenonis*, Dvoretz & Karlstein (p. 80, pls. xl, xliii), *aff. var. Zenonis* (p. 82, pl. xlv), **var. nov.** *Schlotheimi* Klein-Kuchel & Karlstein (p. 82, pls. xliv, xlvii, li, liii, lvii), **var. nov.** *typica*, Dvoretz, Karlstein, Mníšek (p. 84, pls. xlii, xlviii, li, liv), **var. nov.** *Schroeteri*, ibid. (p. 85, pls. xl, xlvi, li), all Silurian, black limestone e 1–2, Bohemia; *S. subornatus*, **n. sp.**, Silurian, black limestone of Karlstein and elsewhere, Bohemia (p. 78, pls. xl, xliv, lviii, lxii): WAAGEN & JAHN (246).

†*Scytalecrinidæ*, incl. *Scytalecr.*, *Decadocr.*, referred to *Dendrocrinoidea*; BATHER (22) p. 922.

†*Scytalecrinus* seu *Scytalocrinus*, reference of *Dactylocrinus* Sladen to this questioned (p. 233); *S. arachnoideus*, **n. sp.**, Pilton beds of Barnstaple, Woodwardian Mus. (p. 235, pl. xxxviii); *S. stadiodactylus* Whidb. (sub *Poteriocr.*) incl. *Poteriocr. batheri* Whidb., Pilton beds of Braunton and Roborough, Barnstaple Athenæum, of Barnstaple, Woodwardian Mus., of Pilton, Porter coll. (p. 233, pls. xxxvi, xxxvii): WHIDBORNE (250).

†*Siphonocrinus*; BATHER (24) p. 125.

†*Sphaerocrinidæ*, incl. *Sphaerocr.*, *Parisocr.*, referred to *Cyathocrinoidea*; BATHER (22) p. 922.

†*Spyridiocrinus* Oehl. syn of *Trybliocr.*; BATHER (24) p. 127.

†*Stelidiocrinus*, vide *Patelliocrinidae*.

†*Stemmatocrinus*, vide *Encrinidae*.

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†*Stortingocrinus*, referred to *Symbathocrinidae*; BATHER (22) p. 921.
†*Streptocrinus*, vide *Botryocrinidae*.
†*Strophocrinus*, n. g., with genotype *S. dicyclicus*, n. sp., from Galena (= Trenton) series at St. Paul, Minn., described as "a Cystocrinoidean," is allied to *Carabocrinus*; SARDESON (207) Amer. Geol. xxiv.
†*Symbathocrinus*? sp. indet., Permo-carboniferous of Yarkalo, in Lantsan-Kiang valley, brachials only; LÓCZY (149) p. 117, pl. iv.
†*Synerocrinus*, vide *Dactylocrinidae*.
†*Tanaocrinidae*, referred to *Batocrinoidea*; BATHER (22) p. 922.
†*Tanaocrinus*, referred to *Batocrinoidea* as ancestor of *Carpocrinidae* in fam. *Tanocrinidae*; BATHER (24) p. 121.
†*Taxocrinidae* incl. *Taxocr.*, *Gnorimocr.*, *Anisocr.*, *Homalocr.*, referred to *Flexibilia Impinnata*; BATHER (22) p. 923.
†*Taxocrinus*:—*T.* sp.; GRABAU (108) p. 285. *T. macrodactylus*, redescr. from one of Phillips' cotypes and 8 other specimens; WHIDBORNE (250) p. 215, pl. xxxiii. *T. nuntius* (Hall, sub *Forbesiocr.*), cup and isolated arms; GRABAU (107) p. 145, fig. 27; [brachia vero non Taxocrini, Calpiocrini autem magis similia]. *T. stultus* Whidb., Pilton beds of Pilton and Poleshill in Porter coll., of Roborough in Barnstaple Athenæum, now first descr. and figd.; WHIDBORNE (250) p. 216, pl. xxxiv.
Thaumatocrinidæ, n. fam. of *Flexibilia Pinnata*; BATHER (22) p. 923.
Thaumatocrinus, anals; BATHER (24) pp. 37, 43.
†*Thenarocrinus*, vide *Dendrocrinidæ*.
†*Thiollericrinus*, vide *Antedonidæ*.
†*Thysanocrinidæ* W. & Sp., restricted; BATHER (24) p. 120.
†*Tribrachiocrinus*, vide *Cromyocrinidæ*.
†*Trybliocrinus* Geinitz antedates *Spyridiocrinus* Oehlert; BATHER (24) p. 127.
†*Uintacrinidæ*, referred to *Dendrocrinoidea*; BATHER (22) p. 922.
†*Uintacrinus socialis*, infrabasals in some specimens; SPRINGER (220): slab with 120 individuals; WOODWORTH (258) p. 5, pl.
†*Ulocrinus*, vide *Cromyocrinidae*. *U. blairi*, not *Ulocr.*, but between *Eupachycr.* and *Ulocr.*, diagr. of anal area (32); *U. buttsi* and *U. kansasensis*, anal areas (p. 33, text-fig. 3): BATHER (24).
†*Uperocrinus*, vide *Hyperocr.*
†*Vetavicrinus*, n. g. with genotype *V. haueri*, n. sp., Silurian, black limestone, e 1–2, Dvoretz, Bohemia; WAAGEN & JAHN (246) p. 98, text-fig., pl. lxi.
†*Woodocrinus*, vide *Scaphiocrinidæ*.
†*Xenocrinidæ*, incl. *Xenocr.*, *Compsocr.*, *Abacocr.*, referred to *Batocrinoidea*; BATHER (22) p. 922.
†*Zeacrinus*, vide *Scaphiocrinidæ*: anal area, analysis of cup; BATHER (24) p. 33, text-fig. 8.
†*Zenkericrinus*, n. g., with genotype *Z. melocrinoides*, n. sp., Silurian, black limestone, e 1–2, Dvoretz, Bohemia; WAAGEN & JAHN (246) p. 102, text-fig., pl. xlii.

(G.)—†CYSTIDEA

(including EDRIOASTEROIDEA).

General account, *Cystidea*, defined and divided into Orders *Amphoridea*, *Rhombifera*, *Aporita*, and *Diploporita*; BATHER (22) pp. 919, 920; redefined (p. 63), and restricted by removal of *Thecoidea* (= *Edrioasteroidea*) and *Carpoidea* (= *Anomalocystida*), and synopsis of classifi-

† All extinct.

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cation (p. 65) into *Dichoporita* and *Diploporita*, followed by detailed and exhaustive monograph; JAEKEL (130).

Edrioasteroidea, defined as Class, with Famm. *Agelacrinidae*, *Cyathocystidae*, *Edrioasteridae*; BATHER (22) p. 923. General principles of taxonomy of *Thecoidea* (= *Edrioasteroidea*) and division into *Thecocystidæ* and *Agelacrinidæ*; JAEKEL (130) p. 32.

Acanthalepis jamesi M'Coy = *Glyptocystis* [i.e. *Cheirocrinus*] cf. *pennigera*; REED (194) p. 762.

Acanthocystis referred to *Cladocrinoidea*; JAEKEL (130) p. 147.

Agelacrinidæ, redefined, incl. *Stromatocystis*, *Cystaster*, *Hemicystis*, *Agelacr.*, *Streptaster*, *Lepidodiscus*, *Haplocystis*, *Discocystis*, and referred to Class *Edrioasteroidea*; BATHER (22) p. 923: redefined and restr. to *Hemicystis* and *Agelacrinus*; JAEKEL (130) p. 47.

Agelacrinus (seu *-ites*), rediagnosed, incl. *Haplocystis*, *Lepidodiscus*, *Streptaster*; JAEKEL (130) p. 49. *A.* sp. of Mourlon 1881, believed to be same as *Protaster decheni*; DEWALQUE (73): = *Dinocystis barroisi* and not *Protaster decheni*; BATHER (23) p. 136. *A. blairi* (p. 51); *A. cincinnatiensis* (olim *Lepidodiscus*), rediagnosed (p. 50, pl. ii); *A. dicksoni*, rediagnosed (p. 50, pl. ii); *A. hamiltonensis*, rediagnosed (p. 51); *A. holbrooki* (p. 50); *A. lebouri*, rediagnosed, probably incl. *A. milleri* Sharman & Newton (p. 51, pl. i); *A. pileus*, rediagnosed (p. 50, pl. i, text-fig.); *A. rhenanus* (olim *Haplocystis*), rediagnosed (p. 50, pl. iii); *A. septembrachiatus*, 7 rayed individual of *A. cincinnatiensis* (p. 50); *A. squamosus*, rediagnosed (p. 51); *A. vorticellatus* (olim *Streptaster*), rediagnosed (p. 50): JAEKEL (130).

Allocystis (*-ites*), discussed, *A. hammelli*; JAEKEL (130) p. 398.

Amorphocystis, n. g. [but see Zool. Rec. 1897] (p. 337) with genotype *A. buchi*, **n. sp.** pro *Caryocystis testudinarius* Buch. non His., and *A. esthoniæ*, **n. sp.**, ? Ordovician drift, Esthland (p. 339); JAEKEL (130).

Amphoridea, redefined, incl. *Aristocystidae*, *Dendrocystidae*, *Anomalocystidae*; BATHER (22) p. 919.

Anomalocystidae, redefined; BATHER (22) p. 919.

Anomalocystis cornutus "probably a crustacean"; WHITFIELD & HOVEY (254) p. 97.

Apiocystinae, sub. fam. of *Callocystidae*, for *Meekocystis* and *Apiocystis*; JAEKEL (130) p. 277.

Apiocystis (*-ites*) Forbes 1848, name preferred to *Lepocrinus* Conrad, nom. nud. and *Lepadocrinus* Hall 1859, prioritatis causa [what about Mather 1843 ?], rediagnosed (p. 279); *A. angelini*, **n. sp.**, Silurian, Gotland (p. 282, pl. xiv); *A. canadensis* (p. 282); *A. elegans*, rediagnosed (p. 282); *A. gebhardi*, rediagnosed (p. 282, text-fig.); *A. huronensis* (p. 282); *A. oblongus* (olim *Pseudocrinus*), rediagnosed (p. 282); *A. pentrematoides*, rediagnosed (p. 282, pl. xv), *A. tecumseth* (p. 282): JAEKEL (130).

Aporita, redefined, incl. only *Cryptocrinidæ*; BATHER (22) p. 920.

Archegocystis, **n. g.** of *Sphaeronidæ* with genotype *Pyrocystis desideratus* Barr., incl. also *P. incertus* Barr., *P. patulus* Barr. and *Aristocystis bohemicus* Barr., pl. xxv, fig. 15 [but Barrande names this *Echinosphaerites infaustus*]; JAEKEL (130) p. 395, pl. iii.

Aristocystidæ, defined; BATHER (22) p. 919: redefined in sense different from both Haeckel and Bather, incl. *Aristocystis* and *Trematocystis*, morphology discussed; JAEKEL (130) p. 407.

Aristocystis (*-ites*), redefined and discussed (p. 411); *A. bohemicus*, rediagnosed, incl. *A.? grandiscutum* and *A.? rudis* (p. 412, pl. iii); *A. desideratus*, *A. idealis*, *A. potens*, and *A. sculptus*, are probably *Codiacystis* (p. 412); *A. subcylindricus* var. *bohemicus* is a *Codiacystis* (p. 412): JAEKEL (130).

Ascocystis, see IV, F.

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Asteroblastus, rediagnosed, with syn. *Asterocystis* Haeck., and descr. (p. 383 text-fig.); *A. foveolatus*, rediagnosed with syn. *A. stellatus* Eichw. (p. 389, pl. vii); *A. sublaevis*, **n. sp.**, Lower Vaginatenkalk near St. Petersburg (p. 389, pl. xviii); *A. tuberculatus*, rediagnosed (p. 389, pl. vii, text-fig.); *A. volborthi*, rediagnosed (p. 389, pl. vii): JAEKEL (130). [V. sub IV, H]

Blastoidocrinus discussed as possible *Mesocystid*; JAEKEL (130) p. 389.

Calix, rediagnosed and discussed (p. 402); *C. halli*, doubtful (p. 404); *C. sedgewicki* [sic], probably incl. *C. barrandei* and *C. davidsoni* Rouault, *Echinosphærites murchisoni* Barr. and Vern. (p. 404, pl. iv): JAEKEL (130).

Callocystidae, redefined and discussed, with subfamm. *Glyptocystinae*, *Apiocystinae*, *Staurocystinae*, *Callocystinae*; JAEKEL (130) p. 266.

Callocystinae, subfam. of *Glyptocystidæ*; BATHER (22) p. 920: subfam. of *Callocystidæ* for *Hallicystis*, *Sphaerocystis*, and *Callocystis*; JAEKEL (130) p. 286.

Callocystis (*-ites*), rediagnosed, syn. *Anthocystis* Haeckel (p. 289); *C. jewetti* (p. 291, pl. xvi, text-fig.); *C. tripectinatus* (p. 291): JAEKEL (130).

Caryocrinidae, rediagnosed, and restr. to *Caryocrinus*, *Hemicosmites*, *Corylocr.*, *Juglandocr.*, *Stribalocystis*, morphology discussed; JAEKEL (130) p. 292.

Caryocrinus (*-ites*), rediagnosed; JAEKEL (130) p. 313. *Cariocrinus* [sic passim], relations to *Strophocr.* and *Crin.* generally; SARDESON (207) p. 270 et sqq. *C. ornatus*, rediagnosed, with syn. *C. loricatus* Say; *C. roemeri*, now first diagnosed; JAEKEL (130) p. 314, pl. xvii, text-fig.

Caryocystis (*-ites*), rediagnosed with synn. *Heliocr.* Eichw., *Orocystis* Barr., *Heliocystis* Haeck., et alia (p. 327); *C. aranea*, rediagnosed with synn. *Heliocr. radiatus* and ? *Caryocystis prominens* (p. 330, pl. ix); *C. balticus*, rediagnosed, probably incl. *C. davisi* and *C. granatum* of Forbes 1848 (p. 329, pl. ix); *C. burdigalensis*, **n. sp.**, Upper Ordovician, Bussaco near Coimbra, Portugal (p. 330); *C. confortatus* (olim *Echinosphaera*) rediagnosed with synn. *E. vexatus* and *E. quaerendus* Barr. (p. 330); *C. granatum*, rediagnosed (p. 329, pl. ix); *C. helmhackeri* Barr. (sub *Orocystis*) rediagnosed (p. 330, pls. ix, x) with **var. nov.** *thuringiae*, Upper Ordovician, Döschnitz, Thuringia (p. 330, pl. xiii): JAEKEL (130). *C. litchi*, vide sub *Eucystis*. *C. minutus* Forbes, intermediate between *Sphaeronis* and *Eucystis* (p. 407); *C. ovum* Schloth. (sub *Echinosphærites*) doubtfully maintained (p. 330); *C. piriformis* Forbes, intermediate between *Sphaeronis* and *Eucystis* (p. 407); *C. rouvillei*, rediagnosed (p. 330, pl. x): JAEKEL (130).

Cheirocrinus, vide *Chirocrinus*.

Chirocrinidæ, defined, incl. only *Chirocrinus*; JAEKEL (130) p. 212.

Chirocrinus distinguished from *Glyptocystis*, but incl. *Homocystis*, rediagnosed (p. 212); *C. alter*, rediagnosed (p. 221, pls. x, xi); *C. anatiformis* (p. 221); *C. atavus*, **n. sp.**, Vaginatenkalk, Pulkowa, St. Petersburg (p. 219); *C. degener*, **n. sp.**, Vaginatenkalk near Petersburg (p. 221); *C. forbesi*, rediagnosed (p. 221); *C. giganteus*, rediagnosed (p. 220, pl. xi); *C. granulatus*, **n. sp.**, Brandschiefer of Kuckers Esthland (p. 220, pl. xi); *C. insignis*, **n. sp.**, Vaginatenkalk, Wolchow (p. 221, pl. xviii); *C. interruptus*, **n. sp.**, Ordovician near Petersburg (p. 220, pl. x); *C. leuchtenbergi*, rediagnosed (p. 220); *C. logani*, rediagnosed, with var. *gracilis* (p. 220); *C. nodosus*, **n. sp.**, Middle Ordovician, *Ogygia* beds, Hovindsholm, Norway (p. 221, pl. x); *C. ornatus*, rediagnosed (p. 220); *C. penniger*, rediagnosed (p. 220, pl. ix, text-fig. 36): JAEKEL (130) vide etiam sub *Glyptocystis*. *C. radiatus*, **n. sp.**, Vaginatenkalk, N. of L. Ladoga (p. 220, pl. xviii, text-fig. 40); *C. sculptus*, rediagnosed (p. 221); *C. striatus*, **n. sp.**, Vaginatenkalk,

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near Petersburg (p. 221, pl. xi); *C. volborthi*, rediagnosed (p. 220); *C. walcotti*, **n. sp.**, Trenton limest., Trenton Falls, U. S. (p. 221, pl. xi): JAEKEL (130).

Cigara dusli, is based on stem-fragments; JAEKEL (130) p. 147.

Codiacystis, **nom. nov.** pro *Craterina* Barr. non Bory, rediagnosed and discussed (p. 398); *C. sp. ind.*, Upper Ordovician, Frasno, Spain (p. 402); *C. bohemica* (p. 401, pl. iv): JAEKEL (130).

Comarocystidæ defined; BATHER (22) p. 920.

Corylocrinus, rediagnosed with synn. *Juglandocr.* Koenen, ? *Hemicosmites* Forbes and Salter non Buch, ? *Stribalocystis* Miller (p. 311); *C. crassus* olim *Juglandocr.* rediagnosed (p. 312); *C. elongatus*, **n. sp.**, Upper Ordovician of Grand Glanzy near Cabrières (p. 312, pl. xvii, text-fig.); ? *C. occidentalis*, **n. sp.**, single plates from Upper Ordovician of Bussaco, Portugal (p. 312); *C. pyriformis*, rediagnosed (p. 312): JAEKEL (130).

Crinocystis ? rectus referred with doubt to *Rhodocr.*; WHITFIELD & HOVEY (254) pp. 94, 99.

Cryptocrinidæ, defined; BATHER (22) p. 920.

Cyathocystidæ, **nov. fam.** pro *Cyathocystis*, defined and referred to Class *Edrioasteroidea*; BATHER (22) p. 923.

Cyathocystis, rediagnosed (p. 42); *C. plautinæ* (p. 43, pl. i); *C. rhizophora* (p. 43): JAEKEL (130).

Cyclocystoides, referred with doubt to *Agelacrinidæ*; BATHER (22) p. 923.

Cystaster, rediagnosed; JAEKEL (130) p. 43: vide *Agelacrinidæ*. *C. granulatus*, restr., part becomes *Thecocystis sacculus*; JAEKEL (130) p. 44, pl. i.

Cystidea concomitans not a *Stromatocystis* as Pompeckj thought, but a lobolith; JAEKEL (130) p. 147.

Cystoblastidæ, **n. fam.** for *Cystoblastus* only; JAEKEL (130) p. 222.

Cystoblastus, rediagnosed and described (p. 223); *C. kokeni*, **n. sp.**, Ordovician, C 2. Brandschiefer, Kuckers, Esthland (p. 230, pl. xvi, text-figg.); *C. leuchtenbergi*, rediagnosed (p. 230, pl. xvi): JAEKEL (130).

Dactylocystidæ, **n. fam.** pro *Dactylocystis* et *Protocrinus* [= *Protocrinidæ* Bather], morphology and phylogeny; JAEKEL (130) p. 425.

Dactylocystis, **n. g.** [syn. of *Proteroblastus* Jaekel 1895] (p. 434) with genotype *D. schmidti*, **n. sp.**, Middle Ordovician, *Hemicosmites* beds, Uxnorm near Reval, Esthland (p. 436, pl. v). *D. mickwitzi*, **n. sp.**, Middle Ordovician, Wesenberg beds, of Sack near Reval (p. 436, pl. v): JAEKEL (130).

Dendrocystidæ defined; BATHER (22) p. 919.

Dichoporita ord. nov. [but = *Rhombifera*] defined, general morphology discussed, divided into suborders *Regularia* and *Irregularia*; JAEKEL (130) p. 178 et sqq.

Dinocystis, n. g. with genotype *Dinocystis barroisi*, n. sp., Condroz, Ardennes [but already described by BATHER (16A) Zool. Rec. 1898]; JAEKEL (130) p. 47, pl. ii: not the same as *Agelacrinus* of Mourlon 1881; DEWALQUE (73): etymology, horizon, identity with *Agelacrinus* of Mourlon 1881; BATHER (23): vide *Edrioasteridæ*.

Diploporita, redefined, incl. *Sphaeronidae*, *Glyptosphæridae*, *Protocrinidae*, *Mesocystidae*, *Gomphocystidae*; BATHER (22) p. 920: redefined, general morphology discussed, contains famm. *Mesocystidae*, *Sphaeronidae*, *Aristocystidæ*, *Glyptosphaeridæ*, *Dactylocystidæ*, *Gomphocystidae*; JAEKEL (130) p. 346.

Discocystis, vide *Agelacrinidæ*. *D. kaskaskiensis*, *D. optatus*, *D. sampsoni*, discussed; JAEKEL (130) p. 47.

Echinodiscus Worth. and Mill. non Ag. vide *Discocystis*.

Echinoëncrininae, sub-fam. of *Glyptocystidae*; BATHER (22) p. 920.

Echinoëncrinus (*-ites*), rediagnosed and described, phylogenetic relations

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to other genera (p. 242); *E. angulosus*, rediagnosed, with **n. var.** *quadrata*, Vaginatenkalk near St. Petersburg, and **n. var.** *compta* ibid. (p. 248, pl. xiii); *E. laevigatus*, **n. sp.**, Ordovician, loc. ? (p. 248, pl. xiii); *E. lahuseni*, **n sp.**, Vaginatenkalk or Glauconitkalk, St. Petersburg (p. 247, pls. i, xiii, text-fig.); *E. reticulatus*, **n. sp.**, Vaginatenkalk, St. Petersburg (p. 248, pl. x); *E. senckenbergii*, rediagnosed, with syn. *Echinosphaerites granatum* Schloth. non Wahlb. and **var. nov.** *interlaevigata*, Vaginatenkalk near Petersburg (p. 248, pl. xiii): *E. striatus*, rediagnosed (p. 248): JAEKEL (130).

Echinosphaera (*-ites*), rediagnosed, with synn. *Deutocystis*, *Arachnocystis*, *Trinemacystis*, *Citrocystis* et alia, morphology; JAEKEL (130) p. 331. *E.* sp.; REED (194) pp. 732, 737. *E. aurantium*, rediagnosed with synn. *E. alcyonium* Schloth., *Sphaernites citrus* His., and **var. nov.** *suecica*, Upper Orthoceras limest., Sweden (p. 336, pl. viii, text-figg.); *E. barrandei*, **n. sp.**, Upper Ordovician, Zahorzan, Bohemia, based on *E. infaustus* Barr. pars (p. 337); *E. belgicus*, **n. sp.**, Upper Ordovician, Gembloux (p. 337); *E. difformis*, **n. sp.**, Mid. Ordovician, c 3, Itfers bed near Jewe, Esthland (p. 336, pl. viii); *E. ferrigena* Barr. referred to *Glyptosphaera* (p. 425); *E. globosus*, **n. sp.**, Ordovician, Esthland (p. 336, pl. viii); **var. nov.** *anglica*, Mid. Ordovician, Ireland, type in Berlin Mus. (p. 337); *E. grandis*, **n. sp.**, Ordovician near Reval (p. 336): *E. granulata*?; REED (194) p. 723, rediagnosed (p. 337); *E. infaustus* Barr. rediagnosed (p. 337, pl. viii); Barrande, pl. xxv, f. 15 quoted erroneously as *Aristocystites bohemicus* and referred to *Archegocystis* (pp. 395, 412); *E. kloedeni*, **n. sp.**, based on *E.* ? *citrus* Kloeden non His., Mid. Ordovician in N. German Diluvium (p. 336); *E. pirum*, **n. sp.**, Mid. Ordovician, c 3, Itfer, Esthland (p. 336, pl. viii): JAEKEL (130).

Echinosphaeridæ, redefined; BATHER (22) p. 920: rediagnosed and restr. to *Echinosphaera*, *Caryocystis* (cum synn.) *Stichocystis*, *Amorphocystis*, morphology discussed, phylogeny; JAEKEL (130) p. 315.

Edrioaster, rediagnosed on evidence of E. Billings and unpublished notes and photographs of BATHER (p. 44); *E. bigsbyi* (p. 46, pl. ii); *E. buchianus* (p. 46, text-fig.): JAEKEL (130).

Edrioasteridae, **nov. fam.** pro *Edrioaster*, *Dinocystis*, defined and referred to Class *Edrioasteroidea*; BATHER (22) p. 923.

Eocystis Walcott, referred to Cladocrinoidea; JAEKEL (130) p. 147.

Erinocystis, **n. g.** of *Scoliocystidae* (p. 249) with *E. angulata* (p. 252), *E. sculpta* (p. 253) and *E. volborthi* (p. 253), **n. spp.**, all Ordovician of Esthland or St. Petersburg; JAEKEL (130) pl. xiii.

Eucystis, rediagnosed and discussed, incl. *Proteocystis* (p. 405); *E. flava* (Barr. as *Proteocystis*) redefined (p. 407, pl. iv); *E. hercynica*, **n. sp.**, Upper Lower Devonian of Sprakelsbach near Zorge, Harz (p. 407); ? *E. litschi* [sic] (Forbes, as *Caryocystis*) perhaps *Sphaeronis* or intermediate form (p. 406); *E. raripunctata*, redefined (p. 407, pl. iv): JAEKEL (130).

Fungocystis, syn. of *Protocrinus* (p. 430); *F. solitarius*, possibly syn. of *Protocr. rarissimus* (p. 434): JAEKEL (130).

Glaphyrocystis, **n. g.** of *Scoliocystidæ* (p. 253), with genotype *G. wohrmanni*, **n. sp.**, Upper Ordovician, F., Hohenholm, Esthland (p. 256 pl. x, and text fig.), and *G. compressa*, **n. sp.**, Upper Ordovician, F, Oddalem, Esthland (p. 257); JAEKEL (130).

Glyptocystidae, redefined, incl. *Echinoencrininae*, *Callocystinae*, *Glyptocystinae*; BATHER (22) p. 920.

Glyptocystinae, sub-fam. of *Glyptocystidae*; BATHER (22) p. 920: sub-fam. of *Callocystidae*, incl. only *Glyptocystis*; JAEKEL (130) p. 274.

Glyptocystites, Billings non Schmidt, rediagnosed (p. 275) with only one species. *G. multiporus*; JAEKEL (130) p. 277, pl. xv, text-figg. *G.*

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[an *Cheirocrinus*] sp. (pp. 732, 763); *G.* cf. *pennigera* [*Cheirocrinus penniger*] (pp. 723, 744, 762): REED (194).

Glyptosphaera (*-ites*) redefined and discussed (p. 423); *G.*, **n. sp.**, Upper Ordovician of Frasno, Spain, no description or figure (p. 425); *G. ferrigena* (Barr. sub *Echinosphaera*) rediagnosed (p. 353, f. 80 and p. 425); *G. leuchtenbergi*, rediagnosed (p. 423, pl. iv); *G. mariae*, **n. sp.**, Ordovician in Drift [? of N. Germany], cotypes at Berlin (p. 118, f. 26 and p. 425): JAEKEL (130).

Glyptosphaeridae defined; BATHER (22) p. 920: redefined in sense different from Bernard but almost same as Bather, incl. only *Glyptosphaera*,—morphology; JAEKEL (130) p. 421.

Gomphocystidae, defined; BATHER (22) p. 920: redefined in sense different from both S. A. Miller and Bather, incl. *Gomphocystis* and *Pyrocystis*, morphology; JAEKEL (130) p. 414.

Gomphocystis (*-ites*), rediagnosed, date of name discussed, morphology (p. 419); *G. clavus*, syn. of *G. glans* (p. 421); *G. gotlandicus*, rediagnosed (p. 421, pl. ii); *G. glans*, rediagnosed (p. 421, pl. ii); *G. indianensis*, rediagnosed (p. 421); *G. tenax*, rediagnosed (p. 421): JAEKEL (130).

Hallicystis, **n. g.** with genotype *Apiocystis imago* Hall (p. 286). *H. imago*, rediagnosed (p. 288, pl. xv); *H. elongata*, **n. sp.**, Niagara limest., Chicago (p. 288 and text-fig. 62); JAEKEL (130).

Haplocystis, vide *Agelacrinidæ*.

Hemicosmites, v. Buch non Hall, rediagnosed; JAEKEL (130) p. 307. *H.* ? sp. indet., Ordovician, near Pu-pjao in Yunnan, China, hexagonal plates only, "viele Porencanäle in wirrer Stellung"; LÓCZY (149) p. 21, pl. vi, & p. 167, vide etiam *H. loczyi*. *H. extraneus*, rediagnosed (p. 310, text-fig.); *H. grandis*, **n. sp.**, Ordovician, F 2, Lyckholm beds, near Hapsal, Esthland (p. 310, text-fig.); *H. laevior*, **n. sp.**, Ordovician near St. Petersburg; based on admittedly abnormal specimen, with 7 infralaterals (p. 309); *H.? loczyi*, **n. sp.**, Upper Ordovician, China (p. 315): JAEKEL (130): no description but for further details, see LÓCZY (149). *H. malum*, rediagnosed (p. 309); *H. pocillum*, **n. sp.**, Mid. Ordovician (? Jewe beds) Esthland (p. 310); *H. pyriformis* Forbes non Buch, perhaps a *Chirocrinus* (p. 315); *H. pyriformis*, pathological individual [so exciting that diagnosis of sp. was forgotten] (pp. 296, 309, pl. xviii); *H. pulcherrimus*, **n. sp.**, Ordovician, D 3, Jewe beds, Sack near Reval (p. 310, pl. xviii); *H. rudis*, **n. sp.**, Mid. Ordovician (Jewe beds), Wassalem, Esthland (p. 310 text-fig.); *H.? rugatus* Forbes, Salter, discussed (p. 314); *H. squamosus* Forbes, discussed, belongs to no recognised genus of *Caryocrinidæ* (p. 314); *H. subglobosus* Hall is either a *Stribalocystis* or a *Callocystid* (p. 307); *H. tricornis*, **n. sp.**, Upper Ordovician, F 2, Borkholm beds, Nömmküll, Esthland (p. 310, pl. xviii); *H. verrucosus*, rediagnosed with ? syn. *H. porosus* Eichw. (p. 310): JAEKEL (130).

Hemicystis (*-ites*), rediagnosed; JAEKEL (130) p. 49, vide etiam sub *Agelacrinidæ*. *H. bellulus*, rediagnosed, incl. *Agelacr. latiusculus* (p. 49, pl. iii); *H. billingsi* (p. 49); *H. bohemicus*, rediagnosed, incl. *Agelacr. tener* (p. 49, pl. i); *H. confertus*, rediagnosed, incl. *Agelacr. velatus*, and *A. bohemicus* pars (p. 49); *H. parasiticus*, rediagnosed (p. 49); *H. simplex*, rediagnosed (p. 49); *H. stellatus*, rediagnosed (p. 49): JAEKEL (130).

Heterocystis armatus, position doubtful; JAEKEL (130) p. 345.

Holocystis (*-ites*) [= *Megacystis*] Hall non Lonsdale, referred to *Cladocrinoidea*, but the species described under that name by S. A. Miller are referred to *Trematocystis*; JAEKEL (130) p. 413.

Homocystis tertius Barr., see *Leptocystis*.

Irregularia, **sub-ord. nov.** of *Dichoporita*, incl. *Caryocrinidae*, *Echinosphaeridae*, *Tetracystidae*; JAEKEL (130) p. 291.

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Juglandocrinus, see *Corylocrinus*.
Lapillocystis, is based on stem fragments; JAEKEL (130) p. 147.
Lepidodiscus, vide *Agelacrinidæ*.
Lepocrinites moorei made type of *Meekocystis* (q. v.); JAEKEL (130) p. 277.
Leptocystis, **n. g.** *Chirocrinidæ*, based on *Homocystis tertius* Barr.; JAEKEL (130) p. 222.
Lichenocrinus, compared with root of *Strophocr.*; SARDESON (207) p. 275.
Lichenoides is aberrant and ancient *Cladocrinoid*; JAEKEL (130) p. 147.
Lodanella mira Kayser, a Cystid allied to *Calix*; JAEKEL (130) p. 404.
Macrocystellidae, **n. fam.**, defined; BATHER (22) p. 920.
Malocystidae, **n. fam.**, defined; BATHER (22) p. 920.
Meekocystis, **n. g.**, with genotype *Lepocrinites moorei* [already type of *Lepadocystis* P. H. Carp.]; JAEKEL (130) p. 277, and text-fig.
Mesites [i.e. *Mesocystis*], ambulacra discussed; SOLLAS (216) p. 707.
Mesocystidae, **n. fam.**, defined; BATHER (22) p. 920: defined, incl. *Mesocystis*, *Asteroblastus*, and ?*Blastoidocr.* general discussion; JAEKEL (130) p. 372.
Mesocystis (olim *Mesites*), rediagnosed and described (p. 376); *M. pusyrewskii* (p. 383, pls. vi & xviii): JAEKEL (130).
Pilocystis primitivus, is a swollen root; JAEKEL (130) p. 147.
Pirocystis, see *Pyrocystis*.
Pleurocystidæ, redefined, includes only *Pleurocystis*; JAEKEL (130) p. 230.
Pleurocystis, rediagnosed and described (p. 231); *P. anglicus*, **n. sp.**, Upper Ordovician, ?Scotland, types in Riksmuseum, Stockholm (p. 235, pl. xii); *P. filitextus*, rediagnosed, with syn. *P. elegans* and var. *exornatus* (p. 234, pl. xii, text-fig.); *P. mercerensis*, rediagnosed (p. 235); *P. rugeri*, rediagnosed (p. 235); *P. squamosus*, rediagnosed, with syn. *P. robustus*, and var. *anticostiensis* (p. 234): JAEKEL (130).
Proteocystis flava; KAYSER & HOZAPFEL (132) p. 505, vide etiam sub *Eucystis*.
Protocrinidae, **n. fam.**, defined; BATHER (22) p. 920.
Protocrinus (*-ites*), rediagnosed and discussed, incl. *Fungocystis*, habitat, morphology (p. 430); *P. fragum*, rediagnosed (p. 433); *P. oviformis*, rediagnosed (p. 434, pl. v); *P. rarissimus* (Barr. sub *Fungocystis*) ?incl. *F. solitarius* Barr. (p. 434, pl. iii): JAEKEL (130).
Prunocystis (*-ites*), rediagnosed (p. 260); *P. baccatus* (olim *Echinoencrinus*), rediagnosed (p. 263); *P. fletscheri* [err. pro *fletcheri*], rediagnosed (p. 262): JAEKEL (130).
Pseudocrinus (*-ites*), rediagnosed (p. 283); *P. bifasciatus*, rediagnosed (p. 285, pl. xiv, text-fig.); *P. magnificus*, rediagnosed (p. 285, pl. xiv): JAEKEL (130).
Pyrocystis (*-ites*), redefined and discussed (p. 417); *P. desideratus*, referred to *Archegocystis* (p. 419); *P. incertus*, only indeterminable internal cast (p. 419); *P. patulus*, only indeterminable internal cast (p. 419); *P. pirum*, rediagnosed (p. 419, pl. iii): JAEKEL (130).
Regularia, **sub-ord. nov.** of *Dichoporita*, defined, and morphology discussed, incl. *Chirocrinidae*, *Cystoblastidae*, *Scoliocystidae*, *Pleurocystidae*, *Callocystidae*; JAEKEL (130) p. 193.
Rhombifera, redefined, incl. *Echinosphaeridae*, *Comarocystidae*, *Macrocystellidae*, *Tiaracrinidae*, *Malocystidae*, *Glyptocystidae*, *Caryocrinidae*; BATHER (22) p. 920.
Rhombifera Barr., rediagnosed (p. 340) and restr. to *R. bohemica* (p. 342, pl. x); *R. mira* is a *Stephanocr.* (p. 340): JAEKEL (130).
Schizocystis, now first diagnosed (p. 263); *S. armatus* (olim *Echinoencrinus*), redescribed (p. 266, pl. xii, text-fig.): JAEKEL (130).
Scoliocystidae, **n. fam.** for *Echinoëncrinus*, *Erinocystis*, *Scoliocystis*, *Glaphyrocystis*, *Prunocystis*, *Schizocystis*; JAEKEL (130) p. 235.

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Scoliocystis, **n. g.** (p. 257), with genotype *Caryocystites pumilus* Eichw. (p. 260, pl. xi and text-fig.), and *S. thersites*, **n. sp.**, probably Vaginatenkalk, St Petersburg (p. 260, pl. xi, text-fig.); JAEKEL (130).

Sphaerocystis (*-ites*), rediagnosed (p. 288); *S. dolomiticus*, **n. sp.**, Niagara limestone, Chicago (p. 289, text-fig.); *S. multifasciatus*, rediagnosed (p. 289): JAEKEL (130).

Sphaeronidæ, defined; BATHER (22) p. 920: redefined and fully discussed; JAEKEL (130) p. 390.

Sphaeronis (*-ites*), rediagnosed, with synn. *Pomocystis*, *Pomosphaera* Haeckel, et alia (p. 396); *S. arachnoides* Forbes, referred to *Echinosphaera* (p. 337); *S. globulus*, rediagnosed (p. 398, pl. iv); *S. oblonga*, rediagnosed with synn. *S. minuta* and *S. uva* Ang. and ?*S. sulcifera* Ang. (p. 398); *S. pomum*, rediagnosed (p. 398); *S. stelluliferus* Salter, referred to *Echinosphaera* (p. 337): JAEKEL (130).

Staurocystinae, subfam. of *Cullocystidae*, for *Pseudocrinus* and *Staurocystis*; JAEKEL (130) p. 282.

Staurocystis, rediagnosed (p. 285); *S. quadrifasciata* (olim *Pseudocrinus*) (p. 286, text-fig.): JAEKEL (130).

Stichocystis, **n. g.** (p. 325) with genotype *S. geometrica*, **n. sp.** [*sic*, but name is Angelin's, who figured it], Mid. Ordovician, Scandinavia; JAEKEL (130) p. 327, pl. ix.

Streptaster, vide *Agelacrinidæ*.

Stribalocystis (*-ites*), discussed (pp. 150, 312), *S. gorbyi* is perhaps a *Caryocrinus*, and *S. tumidus* a *Coryloer.* (p. 313); JAEKEL (130).

Stromatocystis (*-ites*), vide *Agelacrinidae*: rediagnosed and discussed (p. 36); *S. balticus*, **n. sp.**, Middle Cambrian of Baltic province (p. 42, pl. ii); *S. pentangularis*, redescr. (p. 42, pl. ii and text-figg.); JAEKEL (130).

Strophocrinus, Sardeson; see under IV F.

Tetracystidae, ?**n. fam.**, pro *Rhombifera* Barr. pars and *Tiaracrinus*; JAEKEL (130) p. 340.

Thecocystidae, **n. fam.** of *Thecoidea* (= *Edrioasteroidea*) incl. *Stromatocystis*, *Cyathocystis*, *Thecocystis*, *Dinocystis*, *Cystaster*, and *Edrioaster*; JAEKEL (130) p. 35.

Thecocystis, **n. g.** with genotype *T. sacculus*, **n. sp.**, Hudson River group, Cincinnati, Ohio (= *Cystaster granulatus* Hall, pars); JAEKEL (130) p. 43, pl. i.

Thecoidea, **nom. nov.** pro *Edrioasteroidea*, defined as Class of Echinoderma, and fully discussed; JAEKEL (130) p. 9.

Tiaracrinidae, defined; BATHER (22) p. 920.

Tiaracrinus, rediagnosed, with syn. *Staurosoma* Barr. non Will. (p. 343); *T. quadrifrons*, rediagnosed (p. 345); *T. rarus* Barr. (sub *Staurosoma*) rediagnosed (p. 345); *T. soyei*, redescr. with syn. *T. oehlerti* Schlueter (p. 345): JAEKEL (130).

Trematocystis, **n. g.** (p. 413) with genotype *T. subglobosus* Miller (as *Holocystites*) (p. 414, pl. iv); JAEKEL (130).

Trochocystis (*-ites*), single plate, Cambrian (Division 1 b) Long Id.; MATTHEW (171) p. 128.

(H.)—†BLASTOIDEA.

Index to all genera and species with synonyms and references, with list of all specimens in British Museum; BATHER (26).

Blastoidea, redefined, and divided into Grades *Protoblastoidea* and *Eublastoidea*, qq.v.; BATHER (22) p. 920.

† All extinct.

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Acentrotremites; BATHER (22) p. 921.
Asteroblastidæ, referred to *Blastoidea* under new grade *Protoblastoidea*; BATHER (22) p. 920.
Asteroblastus, vide sub IV, G.
Astrocrinus, vide *Zygocrinidae*.
Blastoidocrinus, referred to *Protoblastoidea*; BATHER (22) p. 920. [V. IV, G.]
Codaster seu *Codonaster*:—*C. conicus*, **n. sp.**, Pilton beds, Top Orchard, in Woodwardian Mus., compared with *C. hindii*; WHIDBORNE (250) p. 214, pl. XXIX. *C. pyramidatus*; BOWNOCKER (46) pp. 16, 20, 21.
Codasteridae, redefined, incl. *Codaster*, *Phaenoschisma*, *Cryptoschisma*, *Orophocr.*; BATHER (22) p. 920.
Codonoblastida, a series of *Eublastoidea*, incl. *Codasteridae* and *Pentremitidae*; BATHER (22) p. 920.
Cryptoblastus; BATHER (22) p. 921.
Cryptoschisma; BATHER (22) p. 920.
Dimorphicrinus, validity of name discussed; BATHER (26) p. 10.
Eleutherocrinidae, **n. fam.** pro *Eleutherocr.*, defined; BATHER (22) p. 921.
Eublastoidea, defined, and divided into series: *Codonoblastida*, *Troostoblastida*, *Granatoblastida*, qq.v.; BATHER (22) p. 920.
Granatoblastida, a series of *Eublastoidea*, incl. *Nucleocrinidae*, *Orbitremitidae*, *Pentephyllidae* and *Zyyocrinidae*; BATHER (22) p. 921.
Granatocrinus, vide *Orbitremites*.
Heteroblastus; BATHER (22) p. 921.
Mesoblastus; BATHER (22) p. 921.
Metablastus; BATHER (22) p. 921.
Nucleocrinidae, redefined, incl. *Nucleocr.* and *Schizoblastus*; BATHER (22) p. 921.
Nucleocrinus verneuili; BOWNOCKER (46) pp. 16, 27, 33.
Orbitremites Austin, preferred to *Granatocrinus* (p. 23); *O. derbiensis*, locality discussed (p. 25): BATHER (26).
Orbitremitidae, redefined, incl. *Orbitremites*, *Cryptoblastus*, *Heteroblastus*, *Mesoblastus*, *Acentrotremites*; BATHER (22) p. 921.
Orophocrinus, referred to *Codasteridae*; BATHER (22) p. 920.
Pentephyllidae, **n. fam.** pro *Pentephyllum*, defined; BATHER (22) p. 921.
Pentremites godoni, Etheridge and Carpenter 1886, pl. i, f. 11, referred to *P. burlingtonensis*; BATHER (26) p. 40. *P. ovalis* Phillips non Goldf., see *Pentremitidea phillipsii*.
Pentremitidæ, redefined, incl. *Pentremites* and *Pentremitidea*; BATHER (22) p. 920.
Pentremitidea; BATHER (22) p. 920. *P. phillipsii*, **n. sp.**, Pilton beds of Strand near Ashford and Bradiford, in Barnstaple Athenæum, and of Wrafton Lane, in Whidborne Coll., also incl. *Pentremites ovalis* Phill. non Goldf.; WHIDBORNE (250) p. 212, pl. XXIX.
Phaenoschisma; BATHER (22) p. 920.
Protoblastoidea, grade of *Blastoidea*, established for *Asteroblastidæ* and defined; BATHER (22) p. 920.
Schizoblastus; BATHER (22) p. 921.
Steganoblastus, referred to *Asteroblastidae* [erroneously]; BATHER (22) p. 920.
Tricoelocrinus; BATHER (22) p. 921.
Troostoblastida, a series of *Eublastoidea*, incl. *Troostocrinidae* and *Eleutherocrinidae*; BATHER (22) p. 921.
Troostocrinidae, redefined, incl. *Troostocr.*, *Metablastus*, *Tricoelocr.*; BATHER (22) p. 921.
Zygocrinidae, **n. fam.** pro *Zygocr.* [=*Astrocr.*], defined; BATHER (22) p. 921.

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(K.)—INCERTAE SEDIS.

"Irregular pyriform bodies...between the *Pennatulæ* and the Crinoids," transition Middle to Upper Lias, Oxfordshire; WALFORD (147).

†*Bolboporites* sp.; REED (194) p. 732. *B. mitralis* and *B. stellaris* associated with *Chirocr. giganteus* and *C. volborthi* respectively, and thought to be some internal organ; WÖHRMANN quoted by JAEKEL (130) p. 216, footnote.

†"*Corona antiqua*" Barr. MS. "aucun reste de Crinoïde," Devonian g 1, Bohemia; WAAGEN & JAHN (246) p. 193.

†"*Encrinites laso*" Barr. MS., cirri, brachia, Worms or Plants, Silurian, e 2, Bohemia; WAAGEN & JAHN (246) p. 193, pl. lxxvii.

†"*Eucalyptocrinus ? bohemicus*" Barr. MS., probably impression of *Cyrtoceras corbulatum*, Silurian, e 1–2, Bohemia; WAAGEN & JAHN (246) p. 192, pls. lxii, lxxix.

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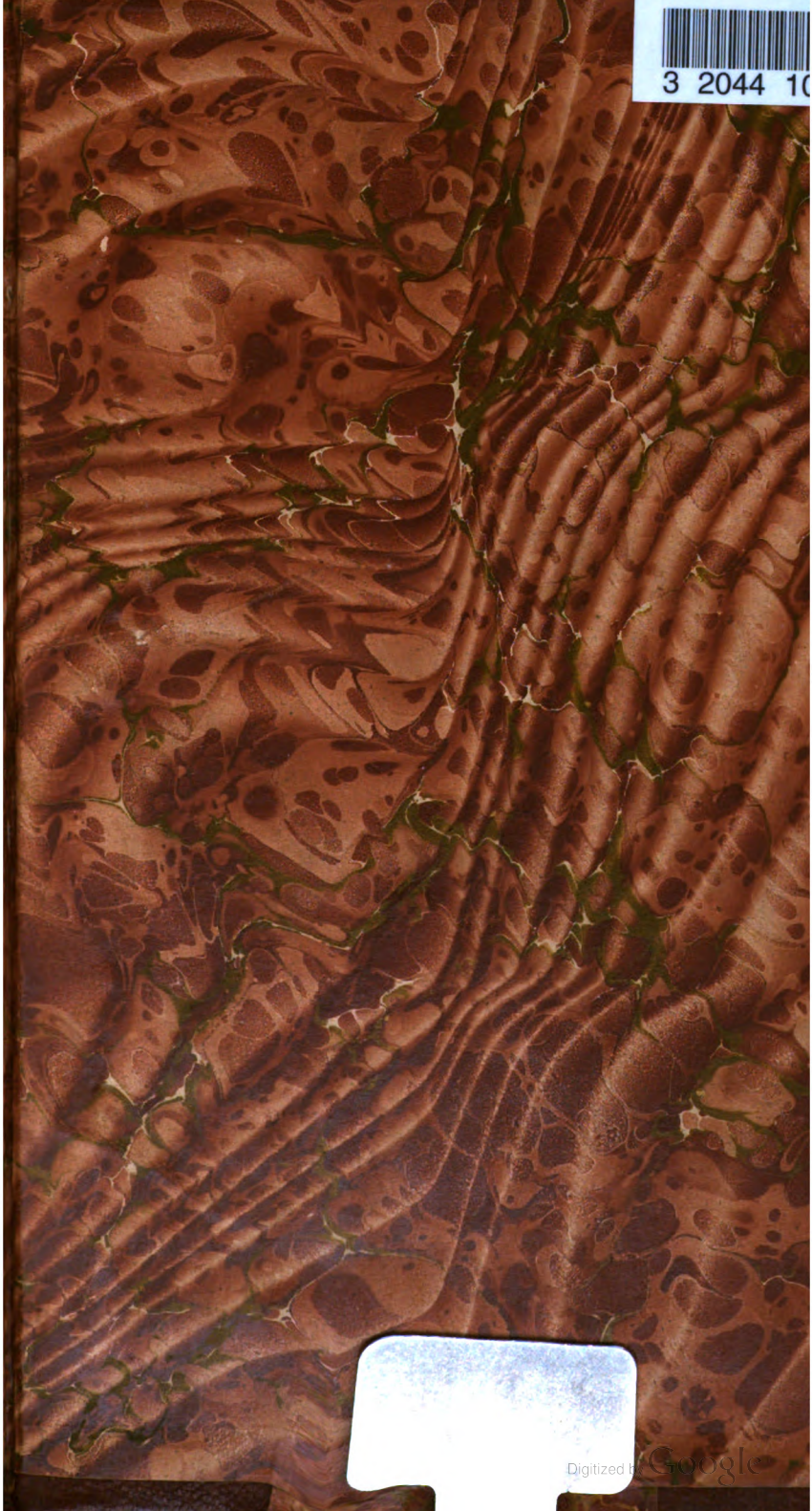
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